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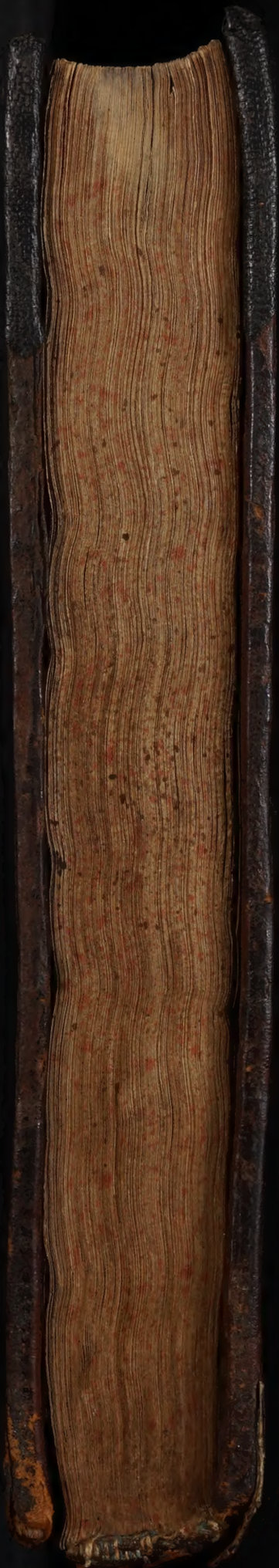

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THE ANATOMY OF AN HORSE.

CONTAINING

An exact and full Deſcription of the *Frame, Situation* and *Connexion* of all his *Parts* (with their *Actions* and *Uſes*) expreſt in Forty nine Copper-plates.

To which is Added

An APPENDIX,

Containing two Diſcourſes:

The one, of the

GENERATION of ANIMALS;

And the other, of the

MOTION of the CHYLE,

AND THE

CIRCULATION of the BLOUD.

By *ANDREW SNAPE*, Jun. Farrier to His MAJESTY.

LONDON,

Printed by *M. Fleſher*, for *J. Hindmarſh*, at the *Golden Ball*, againſt the *Royal Exchange* in *Cornhill*. 1687.

(3) August. 26. 1693.

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AN APPENDIX

TO THE

ANATOMY

OF A

HORSE.

TO

His Most Sacred Majesty,

CHARLES II.

KING of Great *BRITAIN*,

FRANCE and *IRELAND*, &c.

May it please Your Majesty.

NOTHING could have excused, or induc'd me unto, the Presumption of this Address unto Your MAJESTY, if Your Royal Bounty towards me, had not made such an Application my Duty. For being a Son of that Family that hath had the honour to serve the Crown of this Kingdom in the Quality of *Farriers* for these two Hundred Years, and being my self retain'd by Your MAJESTY's Favour in that capacity;

As theſe hereditary and perſonal Engagements were the firſt Motives that put me upon diſſecting of Horſes, that I might be more capable of ſerving Your MAJESTY in my Station; ſo do they entitle Your MAJESTY to the Diſcoveries I have made, as being but the effects of ſuch Obligations. And I do the rather flatter my ſelf with the hope of Your MAJESTY's Pardon in this Particular, in regard that this Eſſay has ſomething in it that is *new*, and withall of *Publick* and *Common Benefit*, which Your Royal Goodneſs hath been pleaſed upon all occaſions to Honour with Your Princely Encouragement and Approbation. For the Intention of publiſhing this Treatiſe being to inſtruct Farriers in the Frame, Situation and Uſe of the Parts of an Horſe, which is the Subject of their Care; They will thereby, I hope, become more skilfull in applying and adminiſtring proper Remedies to the Diſtempers of that Generous Animal, which yields Your MAJESTY and Your Subjects that great ſervice both in Peace and War.

May

The Epiſtle Dedicatory.

May God Almighty long continue Your MAJESTY's Gracious Reign over a Loyal and Obedient People: And that Your MAJESTY will vouchſafe Your Royal Pardon for the boldneſs of this Dedication, is the humble Petition of

Your MAJESTY's

Moſt Loyal and

Obedient Subject

and Servant,

A. Snape.

The Introduction.

THERE is nothing gives a greater check to the progreſs of an Art, than to believe it is already perfected by thoſe that have gone before us, and ſo to content our ſelves with their determinations: For had our ancient Artiſts been thus ſupinely credulous, and thought it ſufficient to have traced their predeceſſors, limiting their wits within other mens bounds, never had time brought to light ſuch diſcoveries in our Profeſſion, nor had the myſteries of our Art been ſo far communicated to poſterity as they already are.

This conſideration induced me to make an attempt for the cultivating and improving our Art *to a greater perfection than it had as yet attain'd to: In order to which conſidering the ſeveral parts of it, and obſerving that our profeſſion has ſuch a correſpondence with that of a Phyſician, that they differ not at all ſaving in the ſubject they act upon; I begun to think, whoſoever would excel in the knowledge of the one, muſt arrive at it by the ſame method as the others do. Now he that once bends his mind toward the practice of Phyſick, firſt applies himſelf to the ſtudy of Anatomy, to underſtand all the Parts (with their actions and uſes) of that Body which is to be the ſubject whereupon his Art is to be exerciſed; without which no wiſe man will think him capable of that profeſſion. And yet how rare amongſt the greateſt part of thoſe that think themſelves no mean Farriers, is the knowledge of that Creature they practiſe upon? whereas it is plain, ſeeing they know not the ſituation and uſe of the parts, they can make but wide gueſſes at the ſeat or nature of the diſtemper, and ſo muſt adminiſter their* Medicines *at random and at all adventures, and be in the moſt opprobrious ſenſe* Horſe-doctors.

Nay I will be bold to ſay ſomething more (which I hope I may ſpeak without the envy of Phyſicians, for whom I have a profound reſpect) that in ſome regards Anatomy is more neceſ-

ſary to Farriers than to them, in order to find out diſeaſes: For beſides the pulſe and the urine, and the pathognomonick ſigns (as they call them) of each diſtemper, they are aſſiſted in their enquiry moreover (not to ſay chiefly) by the complaints and relations of the Patients themſelves: whereas a Farrier having to do with a dumb creature, muſt be very curious in his knowledge of the parts with their offices, and of the ſympathy or conſent that one part hath with another; or elſe, ſeeing all his information muſt be of his own hammering out, he's like to make but a ſhort diſcovery of the diſtemper.

How neceſſary the knowledge of the parts is to the diſcerning of diſeaſes.

Now there are two things chiefly neceſſary to the judging or diſcerning of a diſeaſe, namely the Affection *or diſtemper, and the* part Affected *or diſtempered; the ſignes of which are many, but eſpecially from the* action *of the part affected: As for example, he that knows the action of the Stomach to be concoction or digeſtion, if the concoction be impaired or hindred, he may eaſily judge that the Stomach is ill affected. So likewiſe he that knows the ſituation of the* Liver *to be on the right ſide, and the* Spleen *on the left; if the right ſide be ſore or do ſwell, he cannot but know that the Liver and not the Spleen is affected, and will therefore apply his remedies accordingly. Now he that is ignorant of the parts of the Body ſhall ill know either the ſituation or action of either theſe parts mentioned or any other: and there is no way to come to the underſtanding of them but by Anatomy.*

Seeing then the profit and neceſſity of underſtanding Anatomy is ſuch and of ſo great uſe to us, I thought I could not ſpend my time and endeavours on any thing more conducing to the advancement of our profeſſion, than by applying my ſelf unto it *in the firſt place; wherein having none that have gone before me or ſhew'd me the way, I hope all ingenuous men will be favourable to my undertaking, and not be over ſevere Cenſors of any Imperfections they may poſſibly meet with in the following Treatiſe; and I hope alſo that having broken the Ice, as we ſay, all deſerving Artiſts will be excited to Emulation.*

This Treatiſe then deſigning to teach the Anatomy of an Horſe,

A definition of Anatomy.

we muſt in the firſt place let you know what Anatomy *is: "It "is an opening or cutting up of the Body of any Animal or living "Creature whatſoever, whether frequenting the land or water, whereby*

"*whereby the knowledge of the frame of its body, and the use of*
"*its parts may be attained unto.*

Now this knowledge may be obtained two ways, namely by Inſpection, *or by* Inſtruction; *both which ways are very neceſſary, but the firſt is the more certain, though the latter carrieth more grace and ſtate.* How it is taught.

The firſt, which is Inſpection, *is to look into either the Figures of the parts of Horſes onely, or into the bodies of Horſes themſelves.*

The latter, which is Inſtruction, *is by the Voice of a Teacher or Inſtructor, or by the Writings of famous and renowned men.*

As to the Figures *of the parts, they are thus far neceſſary,* viz. *they daily repreſent to us ſuch parts as we have not the opportunity to ſee in the bodies themſelves: For it is not eaſy to find in all places (nor at ſuch times when we ſtand in moſt need of them) ſuch a ſtore of dead bodies as is neceſſary for us to practiſe upon; wherefore to ſupply the want of ſuch bodies, I do think theſe Figures uſefull, and have therefore accordingly by a curious draught or delineation repreſented to you ſuch obſervations as are made in true diſſections, not by copying out* every *part, but chiefly thoſe that are moſt neceſſary for us to underſtand, omitting thoſe of leſs conſideration, leſt I ſhould make this Volume ſwell too big, and become too chargeable, whereby ſuch would be diſcouraged from buying it, for whom I chiefly intend it.* The Figures of the parts how far neceſſary.

But although I approve of theſe Figures as neceſſary, to be by *us, upon occaſion; yet this caution I muſt give to the Student, that he do not truſt too much to theſe* Copies, *as I may call them, without practiſing upon the* original *body it ſelf: For as it is not poſſible to make a good Commander by viewing onely repreſentative Armies, without practice and experience in real Engagements; ſo is it vain for you to think to attain to the exact knowledge of Anatomy by minding the Figures onely.* A Caution.

Neither would I have any that undertakes this ſtudy to be diſcouraged, for fear they ſhould not get ſuch bodies as I have

mentioned (I mean Horſes bodies) ſufficient for them to practiſe upon; for they may, to ſupply the want of ſuch, take the bodies of Aſſes or Mules, of Sheep and Oxen, Hogs or Dogs, any of which come near the bodies you deſire, eſpecially as to the ſituation and uſe, as alſo hidden motions *of the* Internal *parts: for if thoſe motions be the ſame in Beaſts as in Men, as by a very worthy* * *Authour they are affirmed to be, (who ſaith that the motions of the Heart, the Arteries, the Midriff, the Brain and Guts are the ſame in Beaſts as in Men) they muſt certainly be the ſame in one Beaſt as in another.*

* See Doctor *Crooke*, lib. 1. chap. 9.

The method of Anatomy.

Next we come to ſhew after what manner *you are to take in hand the diſſection of any of theſe Creatures, and that you muſt not doe confuſedly nor diſorderly, but with due courſe of proceeding. For the doing of which take theſe following Rules.*

Firſt then, you muſt begin with that which is beſt known and moſt eaſie, which are the external or outward parts; for as much as the knowledge of them is moſt neceſſary, as to Cures Chirurgical: and theſe parts are commonly diſtinguiſhed into two kinds; one of which are called ſpermatical *and ſolid, which are ſuppoſed to be bred of ſeed, and ſuch are Bones, Griſtles and Ligaments; and the other* ſanguineous, *ſaid to be generated of bloud, as Muſcles.*

I ſhall not in this place give you any particular inſtructions for the anatomiſing any of theſe parts, referring you for them to the book it ſelf: onely advertiſe you of this, that when you deſire a Body for examining the ſolid parts, the bodies of old and lean Horſes are the fitteſt, in regard the fleſh and fat will not ſo much hinder, nor hide the parts from you, as in fat Horſes they will.

You are alſo to obſerve that there is a two-fold way of proceeding in diſſection: The one is where there is a plenty, the other where there is a ſcarcity of dead bodies. If there be a plenty, then you may look into the Muſcles of one, into the Entrails of another, and into the Veſſels of a third, &c. not mattering though you ſpoil one part in diſcovering another: but where they are ſo ſcarce that you can get but one body and that ſeldome too, then if you would ſee all in that body, great skill muſt be uſed to ſhew every thing in its order and place.

Now

The INTRODUCTION.

Now order of diſſection requires that you ſhould firſt begin with the Head, it being the moſt noble and excellent part; next to that the Cheſt, and laſtly the Belly: but this (as I have ſaid) is not to be done where there is but one body, for there you muſt begin with thoſe parts that are moſt ſubject to Corruption, wherefore you muſt firſt cut up the Lower Belly, then the Cheſt, and laſtly the Head; both which ways are often uſed; the firſt being called the way of dignity, and the other of diuturnity; the one being more noble, and the other of a longer durance.

I ſhall not here treat of any of the parts contained in theſe three Regions or Venters, but will leave them till I come to ſpeak of them in their order in the following Treatiſe, my deſign being to be as brief as may be, and not to repeat any thing over ſeveral times, as I have ſeen ſome Authours have done. Therefore I ſhall put an end to this Introduction when I ſhall have informed you, that all the parts which fall under the Anatomiſts knife to be examined are commonly reduced to two heads, namely, ſimple *or ſimilar, and* compound *or diſſimilar.*

Thoſe that are generally accounted ſimple *parts, are in number ten, namely, a Bone, a Griſtle, a Ligament, a Membrane, a Fibre, a Nerve, an Artery, a Vein, Fleſh and Skin. Theſe are called* ſimple *or* ſimilar, *becauſe every particle of them is of the ſame name and ſubſtance; as every part of a bone is bone,* &c. The diviſion of the parts, into 1. Simple,

Yet three of theſe ten, though they are generally accounted ſimple parts, if ſtrictly taken cannot be truly reputed ſo; for firſt, Veins are made of a coat, fibres and valves; ſecondly, Arteries are made of two coats or skins different from one another; and for Nerves, their inner ſubſtance is medullar or marrowey, and the outward, membranous or skinny: ſo that of truly ſimilar or ſimple parts, there are onely ſeven, namely, Bones, Griſtles, Ligaments, Membranes, Fibres, Fleſh and Skin.

The Diſſimilar or compound *parts are thoſe, which, contrary to the* ſimple, *may be divided into ſeveral particles or parcels of unlike or different ſubſtance and denomination: As* 2. Compound.

for

for example, A Leg may be cut into ſeveral pieces, yet not into ſeveral Legs, but into Fleſh, Bones, Veins and other things which it is compounded of; whereas, as was ſaid, a ſimilar part though it be divided into parcels, yet thoſe are ſtill like one another, and of the ſame nature: for ſuppoſe a Ligament be cut into many pieces, every piece partakes onely and truly of the nature of a Ligament, and all remain what they were before, their length or other accident onely excepted.

Thus much for the Introduction, *wherein I mainly intended to ſhew the method of Anatomy, and to hint the reaſon of my undertaking; It now remains that I addreſs my ſelf to the Work it ſelf, which ſhall be writ with the greateſt plainneſs its nature is capable of, that I may thereby attain to that wiſhed end I ſet before me, namely, the benefiting of my Reader.*

THE

THE ANATOMY OF AN HORSE.

BOOK I.

Of the Loweſt Belly or Paunch.

CHAP. I.

Of the Parts inveſting the whole Body, and firſt of the Hair.

BEFORE I take in pieces this Goodly Creature, It will not be amiſs if I firſt give you an account of all theſe Parts as they lie in order, beginning with that which firſt appeareth to our View, and that is the Scarf-skin adorned with hairs, wherein (as in a Caſe) Nature hath wrapped this ſtately Beaſt; beſides which there are other four, that, with this, are *common* to the whole body, which are, firſt, the true skin, which lieth next under it; then the fleſhy pannicle; under that the fat; and laſtly the common membrane of the Muſcles. Beſides theſe five, there are other Inveſting parts, but they are onely *proper* to particular parts of the body, to which I will ſpeak in their due place, and onely of the *common* ones here.

First then I will begin with the *Hairs*, becauſe they meet firſt with the Senſe. They are ſaid to be ingendred of a clammy and earthy Excrement of the third concoction, ſo that themſelves are reputed not ſo properly to be called parts of the body, as Excrements. They are void of ſenſe and of animal life, yet they have a vegetative life, ſuch as Plants have, to which they owe their growth. *Whereof Hairs are ingendred.*

Theſe

How nouriſhed.

Theſe Hairs are by ſome thought to have for their *nouriſhment* a proportionable quantity of that juice of which they are generated, continually miniſtred unto them. Others think that the Hairs being hollow and porous are nouriſhed as the Feathers of Fowl are, and that is by bloud; for if one pull off a Feather from a young Bird that is unfledged, a pretty deal of its ſtem will appear bloudy. But though we ſhould grant that the matter of their nouriſhment were made of bloud, yet certainly it muſt be very much altered and degenerate from its own nature, before it can be adapted to the hair, ſeeing the hair of a Man's head (for example) grows not onely in living perſons, whoſe bloud runs briskly in their Arteries and Veins, whereby it is kept from corruption, but alſo in the dead, in whom the whole maſs of bloud is devoid of all nutritive power, as has been often obſerved in bodies preſerved unburied. But whatſoever the humour be that nouriſhes them, it is thruſt through the skin by the pores thereof, the action and heat of the body aſſiſting thereunto, where the purer part of it enters the roots of the hair, but the more earthy not being able to enter ſuch almoſt unperceivable pores, is driven out amongſt the hair where it becomes duſt; which duſt is that that is brought forth with the Curry-combe when a Horſe is dreſt. From hence then it is, that a Horſe, though he be never ſo well dreſſed one morning, and never ſo clean kept till the next, he ſhall notwithſtanding be as full of duſt as he was the morning before; for the cleaner the skin of a Horſe is kept, the more open are its pores to tranſmit a more plentifull nouriſhment to the hair, whence alſo there is a greater collection of this excrementitious duſt.

How the Hair comes to fall off.

And hence may be gathered a reaſon of the *ſhedding* of the hair, which is obſerved to happen in many Horſes that have ill keeping, ſuch as your Cart-horſes that ſeldom have any labour beſtowed upon them, for want of which dreſſing, to remove the duſt which lieth upon the mouths of the pores or at the roots of the hairs, the paſſages, through which the juice ſhould come that nouriſhes the hair, are obſtructed or ſtopped, and ſo like dead Leaves from a Tree in Autumn they drop off, or as untimely Fruit falls before the ſeaſon of the year requireth it.

Reaſons for the different colour of the hairs.

As for the *Colours* of the hairs, they are various, according as is the humour which doth predominate in the body: for ſuch as the humour is which is driven forth towards the skin for their nouriſhment, ſuch will the colour of the hair be. As for Inſtance:

If the cholerick humour doth moſt predominate, then are the hairs of a black, a Sorrel or a Cheſtnut colour; If bloud moſt predominate, then will the Horſe be a bright Bay or Roan; If flegme, then the Horſe will be of a milk-white or yellow-dun; If melancholy, then will the Horſe be of an Iron-gray or Mouſe-dun. Thus much for the colour of the hairs, next I come to the uſe of them.

Their uſe.

The *uſe* of the hairs is, firſt, to cover the skin; ſecondly, to defend it; thirdly, to be an ornament to it; and laſtly, as I have before ſhewed, to ſuck up that excrementitious ſuperfluous juice which through the pores of the skin is ſent from all parts of the body to them.

CHAP.

CHAP. II.

Of the Cuticle or Scarf-skin.

THE Hide on which the hairs already ſpoken of do grow, conſiſts of two Skins, the outer of which is called the *Scarf-skin*, ſerving to defend the Body from outward Injuries, and for that intent is of it ſelf Inſenſible, that it may the better indure the violence of the weather, or other harms which many times happen to it. And for that cauſe, Nature hath ſo ordered it, that if at any time it happeneth to be rubb'd off, as often it is by an ill Saddle, and many other ways, it groweth again without a ſcar or blemiſh, provided the Parts under it (as particularly the true Skin) be not alſo violated; for they being ſpermatical Parts, or made of Seed, cannot eaſily be reſtored, which is the reaſon that moſt Wounds will not heal up without a ſcar. Now this Scarf-skin having its matter (of which it is made) from the true Skin and the Veſſels that terminate in it, which are of all ſorts, both Veins, Arteries and Nerves, none of which reach any farther than the true Skin, it is apparent that this Skin is without ſenſe, it being their office alone to communicate both life, ſenſe and motion to all parts of the Body. And that this Skin is void of ſenſe, may be ſeen by the cutting of it; as thus, If you cut onely through this Skin, when you go to Rowel a Horſe, you ſhall not find the Horſe move for it, neither will it bleed; but if you cut ſo far as to touch the true Skin under it, you will find him both ſtir and bleed, for then you touch the little threads of the Veſſels, and by violating them, you cauſe the Horſe to feel pain, and alſo bloud to iſſue forth. *The Scarf-skin.*

The *uſe* of this Skin, beſides being a covering to the whole Body, is to cover the mouths of thoſe ſmall hairy Veſſels already ſpoken of, that the bloud, ſpirits, or other ichorous or watery Matter do not iſſue from them, which otherwiſe they would. Yet its Pores are ſo large as to permit the vapourous moiſture that is thruſt out of all parts of the Body to it, to paſs through them, either in the form of ſweat, or by inſenſible tranſpiration. Theſe Pores being many times obſtructed or conſtringed by a ſudden cold taken after hard riding, by giving the Horſe cold Water too ſoon after it, or by waſhing him too high in cold Water when he is hot, the Vapours are thereby hindered from coming forth, and ſo are detained between the two Skins, and there generate evill Diſtempers, or at leaſt fall from thence into the Limbs, and there cauſe Inflammations and breakings out, which we call *Greaſe in the heels* or *Scratchets*. *Its uſe.*

CHAP. III.

Of the Cutis or true Skin.

The true Skin. Its ſubſtance. UNder this Scarf, lieth the *true Skin*, which the Latines call *Cutis*. Its *ſubſtance*, as I have before ſhewed, is ſaid to be ſpermatical, ſuch as being once loſt, cannot be reſtored as formerly it was, but is reunited by a cicatrice or ſcar, that is bred of the dried and conſtringed fleſh under it; which is the reaſon no hairs will grow upon that part of the Skin where the ſcar is, becauſe it is callous and deſtitute of Pores in which they ſhould grow. This Skin doth encompaſs the whole Body as well as the Scarf, and hath the ſame paſſages for the receiving in, and letting out, for the eaſe and relief of the Body, as that hath.

Veſſels. It hath for its nouriſhment, life, and ſenſe, *Veſſels* of all ſorts, Veins, Arteries and Nerves, divaricated and branched through it in the ſmalleſt hair-like threads, all which terminate in it, none of them being inſerted into the Cuticle.

Colour. As for its *colour*, it varieth as do the humours in the Body; for that humour which moſt abounds, coloureth it with its proper reſpective colour; as for example, If bloud moſt abound, then is it moſt red; if choler do moſt predominate, then is it yellowiſh; and ſo for the other humours.

Uſe. Its *uſe* is principally to inveſt and defend the Body, as I have ſaid before of the Scarf-skin: for as that keeps it from the violent impreſſion of either exceſſive heat, or cold; ſo doth this Skin reſtrain, and, as it were, wall in (as in a Caſtle) all the ſpirits and natural heat, which would otherwiſe in hot weather, or in violent exerciſe be ſo faſt ſpent, that they would leave the vital parts deſtitute, which would occaſion the loſs of your Beaſt. But though Nature has made this proviſion to hinder the diſſipation of the ſpirits, yet has ſhe framed the Skin (as well as the Scarf-skin) full of ſmall Pores, through which upon violent exerciſe do iſſue in great plenty hot and moiſt vapours, which are that we call *ſweat*; yea though the Beaſt be at reſt, if the Air be any whit mild or temperate, warm ſteams are continually a paſſing through them by inſenſible tranſpiration.

It's alſo as ſerviceable in cold weather, for then the more fiercely it is beſieged by the cold, the narrower do the aforeſaid Pores purſe up themſelves, whereby the internal heat is detained within, and the external cold kept out.

CHAP. IV.

Of the fleſhy Pannicle.

NEXT to the true Skin, lieth the fleſhy Pannicle, called *membrana Carnoſa*, or *panniculus carnoſus*, becauſe in moſt parts of the Body, it comes near to the nature of fleſh, and is truly muſcular. *The names of the fleſhy Pannicle.*

In Man this Membrane is ſaid to lie under the Fat, though ſome very curious Anatomiſts deny that Man has any ſuch Membrane at all, ſave in the Forehead; and of this opinion is Dr. *Gliſſon*. I will not intermeddle in that Controverſie, as being not proper for me; but in Horſes it lies immediately under the Skin, above the Fat, and is more like to a Muſcle than a Membrane. In fleying off the Skin, you muſt be very carefull and curious, or elſe you will take this Pannicle off along with it, it is ſo cloſely knit to it by Fibres and innumerable Veſſels that go between. It is of the ſame extent and figure as the true Skin, inveſting the whole Body as that does; but in ſome Parts it is almoſt wholly fleſhy, and in others altogether membranous. *Its ſituation, and extent.*

It has *Veſſels* of all ſorts as the Skin has, for before they can reach the Skin, they muſt pierce through this Membrane; and as they paſs through, they ſend forth many ſmall twigs into it, both Veins, Arteries and Nerves, but eſpecially Nerves to aſſiſt its motion, whence it is by ſome called the nervous Membrane. *Its Veſſels.*

The *uſe* of it is chiefly to ſerve for a Muſcle to move the Skin, whereby the Beaſt ſhakes off the Flies, or any other thing that offends him. It ſerves alſo to defend the neighbouring Parts, and to ſtrengthen in their paſſage the Veſſels which are diſſeminated into the true Skin. It alſo hinders the Fat from being melted and ſpent by the continual motion of the Muſcles. And laſtly, it helpeth to heal or cloſe up the Skin when it is cut or otherwiſe hurt; for the Skin being a ſpermatick Part cannot be bred anew, and therefore this fleſhy Membrane helps to glew as it were the ſides of it together again, growing into one body with it, and making what we call a *Scar*. *Its Uſe.*

CHAP. V.

Of the Fat, and Common Membrane of the Muſcles.

FAT is of two ſorts, and is diſtinguiſhed by two ſeveral Names as well in Latin as Engliſh. That which we are to ſpeak of in this Chapter is called in Latin *pinguedo*, and in Engliſh *Fat*; but that which is within the Belly and makes up the Caul and Meſentery and covers the Kidneys, is named *ſevum*, Suet or *Tallow*. The former will not congeal *Fat, its difference and matter.*

ſo quickly or ſo hard as this latter will. Both the one and the other are made of an oily part of the bloud; and this we are to treat of here, is congealed between the Carnous Membrane deſcribed in the foregoing Chapter, and the Common Membrane of the Muſcles.

How generated. This Fat is the fourth common covering of the whole Body, for there is no Part which has the reſt of the common coverings, but has this alſo, if the Horſe be not extreme lean; though the fatteſt have it not in any great plenty. Now as all Food that is eaten, conſiſts of ſeveral parts or principles, which the Chymiſts can ſeparate one from another, namely Salt, Spirit and Oyl; ſo the Food, that conſiſts of theſe ſeveral principles, when it is taken into the Body, and concocted in the Stomach (which is natural Chymiſtry, as I may call it) has them ſo looſened one from another, that each principle paſſes into the nouriſhment and increaſe of that part that is of the ſame nature with it. Amongſt the reſt the oily part, (which is otherwiſe called the Sulphureous, becauſe it will flame like Brimſtone) ſweating as it were through the pores of the Veſſels and ſubjacent parts towards the ſurface of the Body, is ſtopt by the cloſeneſs and compactneſs of the fleſhy Membrane, and there congeals into Fat. Now this Fat is not one continued body as Butter or (what we call) tryed Suet is; but is included in innumerable membranous partitions or cells, almoſt like Honey-combs, (which it is likely are borrowed from the fleſhy Pannicle) which makes the Fat to appear ſomewhat ſpongy. It is not eaſie to give a reaſon of this oily humour's turning into Fat; for it cannot be by cold, ſeeing the Beaſt is always actually warm; much leſs can it be by heat, which is apter to melt Fat into Oyl, than to harden Oyl into Fat: therefore ſome make a moderate heat to be the efficient of it. 'Tis true indeed that the Beaſt is moderately hot, and we ſee by experience that Fat is generated; but that *that* is the cauſe of *this*, I dare not affirm. My apprehenſion of it is this: That when the oily Matter iſſues out of the Veins and Arteries, *&c.* there paſſes along with it much thin watry humour; And when they both come to the fleſhy Membrane, this latter being thin, evaporates through it and is evacuated by ſweat or inſenſible tranſpiration; but the other being thicker and more clammy, is forced to ſtay behind, and loſing by degrees that wheyiſh humour that before kept it liquid, it curdles into Fat.

The uſes of Fat. The uſe of the Fat is, like a Garment, to keep the Body warm, and cheriſh the natural heat, which by its clammineſs it hinders from evaporating too much; and on the other ſide by its thickneſs it ſtoppeth the Pores ſo, that the cold cannot enter in.

It alſo fills up the empty ſpaces between the Muſcles, and the wrinkles of the Skin, by which the Horſe is made plump, ſmooth and beautifull; and therefore old, lean and decrepit Horſes are deformed for want of Fat.

It ſerves alſo as a pillow or bulwark againſt any violence, either from blows, bruiſes or heavy weights, and the like.

Finally, it relieveth ſuch Creatures as abound with it, in time of ſcarcity or want of ſuſtenance, by being converted into nouriſhment; for it ſerves as aliment, and holdeth the parts of the Body in play, till the Creature attain its proper Food.

The common membrane of the Muſcles. The fifth and laſt common Covering of the Body, is the *Common Membrane of the Muſcles.* This is ſpread over all the Muſcles (immediately under the Fat) and is knit by Fibres to that Membrane which is proper to each Muſcle, but ſomewhat looſely, that it might not hinder their

their motion by inveſting them too cloſely. It is ſaid to ariſe from the Back-bone, becauſe it cleaves moſt firmly to the Spine thereof, and is ſtronger there, than in its other Parts. In an Horſe it is as thick as Parchment, and very ſtrong. And its uſe is to confirm and ſtrengthen the Muſcles in general in their proper ſituation, and to be as it were a Caſe for them to move glibly in, and to defend them from injuries.

CHAP. VI.

Of the Inveſting Parts proper to the Lower Belly.

HAVING ſhewed you what are the *common inveſting* or containing parts of the whole Body, I come now to ſhew which are thoſe that are *proper* to the Lower Belly in particular, and thoſe are onely two, beſides thoſe common ones already ſpoken of, namely the *Muſcles* of the Paunch, and the *Rim of the Belly*.

Now by the *Lower Belly* we underſtand all that cavity (and onely that) which is below the Midriff, and is encompaſſed by the ſhort Ribs, the point of the Breaſt-bone, Loins, Haunch-bones, and Share-bones, and is filled with the Guts and other Entrails.

The Muſcles of the Abdomen or Paunch.

The *Muſcles* are in all Horſes of a like number, which is on each ſide four. The firſt pair that ſhew themſelves are called the *External oblique* pair; the next are the *Internal oblique* pair; the third are the two *right* or *ſtreight* Muſcles; and under theſe are the two *tranſverſe* Muſcles, ſo called from their going croſs the Belly.

But before I proceed any further in deſcribing theſe Muſcles, I will firſt ſhew what a *Muſcle* is, and whereof it is compounded, and alſo the ſeveral uſes of the Muſcles in general.

What a Muſcle is.

The Muſcles, if you take them in a large ſignification, are all that which we call Fleſh; which Fleſh may be divided into many pieces or parcels without cutting or breaking any of them, if with care undertaken; and each piece ſo ſeparable, is named a Muſcle.

Muſcles are the inſtrument of voluntary motion.

Now theſe pieces have each their ſeveral diſtinct Epithets, appellations or names from ſeveral conſiderations, as from their ſituation, ſhape, uſe, &c. but are all called Muſcles, their office being to perform the *voluntary motion*: which motion is performed ſix ſeveral ways, namely, upwards, downwards, forwards, backwards, to the right hand and to the left. All which motions are performed in this manner.

You muſt know that all or moſt of the Muſcles of the Body have each their Oppoſite or Antagoniſt, ſo that the one being contracted or drawn together, (which is its proper motion) the oppoſite at the ſame time is relaxed or looſned; and contrarily when that which upon the former motion was relaxed, does it ſelf enter upon motion, it is contracted, whilſt that which was before contracted, is now relaxed. As for example, when you ſtretch out either your Arm, or Leg, that motion is performed by one of theſe Muſcles; and when you draw your Arm, or Leg back again, that is performed by the other.

But

But here let none ſo far miſunderſtand me as to think that either an Arm or Leg can be either ſtretcht forth or drawn back by the help of *one* Muſcle alone; but *as* to either of the before-mentioned Limbs there are ſeveral parts belonging, *ſo* do the diſtinct Muſcles of every part perform (at the ſame time) the offices aforeſaid.

Neither can this voluntary motion be performed without the help of a Sinew or Nerve, by which the Spirits are brought from the Brain which give the Muſcles their moving faculty.

Involuntary or natural motion is performed without Muſcles, properly ſo called.

Now there are other motions of the Body which are not performed by the Muſcles, ſuch as is (according to ſome) the pulſation of the Heart and Arteries, the periſtaltick motion of the Stomach and Guts, of the paſſage of the Gall, and of the Ureters, and ſeveral other Parts which have their continual motions whether the Horſe be ſleeping or waking, and will perform their ſeveral motions as well in Men as Beaſts, whether we will or not. Wherefore theſe are called *not Voluntary*, or *Natural.*

I ſhall in the next place ſhew what parts the Muſcles are compounded of, and thoſe are agreed upon by all Authours of Anatomy to be theſe.

A Muſcle is an organical and diſſimilar part.

A Muſcle being an organical Part is compoſed of Nerves, Fleſh, Fibres, Veins and Arteries, all covered or inveſted with a proper Coat or Skin. It is called *organical*, becauſe it is the inſtrument or organ of an action, to wit, motion. And that it is alſo diſſimilar, the ſeveral kinds of parts whereof it is made, do evidently prove.

Of what ſimple parts it conſiſts.

The ſeveral uſes of the parts that make up a Muſcle are theſe: The Fibres and Tendon are the immediate inſtruments of its action; The Fleſh properly ſo called filleth up the interſtices or diſtances between the Fibres; The Arteries by importing vital ſpirit and bloud do conſerve the inbred heat, and help to nouriſh it; The Veins do convey back to the Heart all that bloud that remains from the nouriſhment of the Muſcle; The Nerves convey animal Spirit to the Fibres and Tendon, whereby they are enabled for their action; and the Membrane or Skin which incompaſſeth the Muſcle, doth keep it together, and diſtinguiſhes one from another.

Why called a Muſcle.

Having ſhewed what a Muſcle is, and the ſeveral ſimple parts whereof it is made, I ſhall next ſhew you why it is ſo called. It is called *mus*, or *muſculus*, by the Latins, for that it is like a fley'd Mouſe, or a Fiſh which is called *muſculus*; and by ſome Authours it is called by the name of *lacertus*, from its ſimilitude with a Creature called a Lizard. Yet there can be no one certain figure whereby to reſemble it, by reaſon of its ſundry ſhapes; but that it is like a fley'd Mouſe in colour, cannot be denied.

Whence Muſcles have diſtinct names.

Now the Muſcles being many in number have accordingly many names, which names they take from either their Figure, their Situation, or their Action, and many times from their Uſe; alſo ſometimes from their Inſertion, and ſometimes from their Magnitude.

And although there be ſuch difference in the Muſcles, in reſpect of their Figures, their Magnitude, their Situation, and the like, yet are they ſo united or conjoyned together through the whole Body, in ſo cloſe a manner, that in many places they are hard to be ſeparated, except at ſome times, when either wind, ſome wheyiſh humour or ſome other matter gets between them, and then many times they will gape, and are at ſome diſtance the one from the other.

Yet are they not ſo cloſely united neither, but that by a carefull and expert Diſſector they may be ſeparated, and one divided from another;

after

after which, to ſee the ſeveral parts of a Muſcle ſeverally, you muſt divide it alſo, which is on this manner.

Some divide a Muſcle into two parts, which are a fleſhy and a tendinous part; Again, they divide it into other three parts, namely, the Head, the Middle and the Tail. By the *Head* is to be underſtood the beginning or original of a Muſcle, which is one while ligamentous and nervous, and otherwhiles fleſhy: By the *Middle* is that part meant which is abſolutely fleſhy; and by the *Tail*, the Tendon, conſiſting of the numerous Fibres that are extended through the Muſcle, and the Membrane that inveſts it, which grow by little and little into one body, and compoſe this Tendon, that is the tail of the Muſcle. It is ſometimes round, ſometimes broad; other times long, and otherwhiles ſhort, thicker or ſlenderer according to the part it appertains to, or according to the uſe it is put to; it being but neceſſary that thoſe Parts which are moved moſt ſtrongly or vehemently, ſhould have thicker and ſtronger Tendons. Thus much for the Muſcles in general. *A Muſcle divided into parts.*

Now I come to the particular Muſcles, the firſt of which are the Muſcles of the *Abdomen* or Paunch, of which I have ſpoken ſomething in the beginning of this Chapter, the which I ſhall now further proſecute, and let you know how they are ſituated. The pair that in diſſection firſt offer themſelves are called the *Oblique* (or ſlanting) *Deſcending External* pair, which pair are the broadeſt of all the reſt, though it is by many Authours ſaid that the oblique internal are equal in figure, magnitude, ſtrength and action. The original or riſe of theſe Muſcles is from the ſide of the Breaſt-bone, the lower edge of five or ſix of the loweſt Ribs, and from the tips of the croſs or tranſverſe proceſſes of the Joints of the Rack-bone in the Loins. Their riſe from the Ribs imitates the teeth of a Saw; for ſpringing with a narrow point from the lower ſide of the Rib, every ſuch point grows broader and broader, till it unite with the two next it on each ſide, ſo that there is a ſpace of above an inch between every point, into which empty ſpaces the greater Saw-like Muſcle of the Breaſt ends with like points. From their riſe they run ſloping downwards toward the *white line* (ſo called) in the middle of the Belly; but before they reach half way thither, they loſe their fleſhy ſubſtance, and become tendinous, and their Tendon is ſo united to the common Membrane of the Muſcles, deſcribed in the foregoing Chapter, that it ſeems to become one with it, and running over the ſtreight Muſcles is inſerted into the foreſaid white Line, down even to the very Share-bone, into which alſo it is inſerted. *The Oblique deſcending external pair.*

The next to theſe are the *Oblique Aſcending Internal* pair, ſo called becauſe of the contrary courſe of their Fibres to thoſe of the External; for as thoſe *deſcend* obliquely or aſlant, ſo do theſe *aſcend* in like manner. Their riſe is from the Rib of the Haunch-bone, and from the proceſſes of the *vertebræ* of the Loins and *os ſacrum*; and their Tendon is extended to the ſhort Ribs partly, and partly to the white line, above the Navel, adhering to the common Membrane of the Muſcles as was ſaid before of the oblique deſcending, where it is not cover'd by the Tendon of that Muſcle. Theſe have a different *action* from the former; for whereas the External pair do draw the lower part of the Belly towards the Breaſt, where they have their original; theſe on the contrary draw down the Cheſt with a kind of ſlanting motion towards the Hips; it being the action of all Muſcles to draw towards their original, and the original of theſe Muſcles is (as was ſaid) at the Rib of the Haunch-bone. *The Oblique aſcending internal pair.* *Their Action.*

After

The right or ſtreight pair. After theſe follow the *Right* or *Streight* Pair, ſo called becauſe their Fibres run ſtreight down the Belly as do the Muſcles themſelves: for their original is at the ſides of the ſword-faſhioned Griſtle at the end of the Breaſt-bone, and from the griſtly ends of the baſtard Ribs, whence they go all along the eminenteſt part of the Belly ſtreight to the Share-bone where they terminate. Now in theſe Muſcles there are ſeveral Inſcriptions or tendinous Interſtices, which are, according to the bigneſs of the Horſe, more or fewer in number, but moſt commonly there are in each Muſcle eight, not ſo fair indeed as in Humane Bodies, but yet ſo plain, that they do diſtinguiſh the Muſcles into nine parts or more, as there are eight of theſe inſcriptions or more; and beſides, each part has a diſtinct Nerve: and yet notwithſtanding, becauſe they cannot be eaſily ſeparated one from another, they do by moſt Anatomiſts go for onely one pair. On the inſide of theſe Muſcles are to be ſeen the Epigaſtrick Arteries and Veins aſcending, and the Mammary Arteries and Veins deſcending, which by an ancient Tradition have been held in Humane Bodies to inoſculate one with another, the Arteries with the Arteries, and the Veins with the Veins; but later and more inquiſitively curious Anatomiſts have diſcovered it to be a mere fancy, invented to ſupport the erroneous Opinion, That whilſt the Young was in the Womb, it was nouriſhed with bloud carried to it by the Hypogaſtrick Arteries and Veins; but after the birth, the bloud altering its courſe, regurgitated up from the Womb, by the Epigaſtrick Veſſels, which inoſculating with the Mammary, conveyed it to the Breaſts, where it was converted into Milk. This I ſay was the opinion as to Women, which has in ſeveral particulars been detected of errour: and may receive a further confutation in Mares, from the different ſituation of their Udders from the Breaſts in Women; whereas theſe Veſſels have the ſame Courſe in both. The

Their Action. *action* of theſe Muſcles is to ſhorten the Belly by drawing the Breaſt and Share-bone towards one another, whereby it is drawn as it were on a heap, to ſqueez forth the Excrements or Urine, whence Dogs that ſtrain ſo hard to dung, have theſe Muſcles ariſing as high up as the Channel-bones.

The pyramidal Muſcles. There are other two Muſcles (ſometimes to be found) which do reſt upon the Tendons of the Right Muſcles at the lower end of them, which I have not yet ſpoken of, and theſe are called the *pyramidal* Muſcles. They are of a triangular figure, and their uſe is to aſſiſt the ſtreight Muſcles in their ſqueezing forth the Excrements, ſaith *Fallopius*. I believe theſe Muſcles are ſo ſeldom found, that they ought to be accounted *luſus Naturæ*, a ſport of Nature; for I do not remember that ever I have obſerved any other here, but what ought to be accounted the loweſt part or portion of the ſtreight Muſcles before deſcribed.

The tranſverſe or overthwart Muſcles. Under all theſe lie the tranſverſe or overthwart Muſcles, ſo called from their own and their Fibres running croſs or overthwart the Belly. They are of a quadrangular or fourſquare figure, and do ſtick ſo cloſe to the Rim of the Belly (which is under them) that they cannot eaſily be ſeparated.

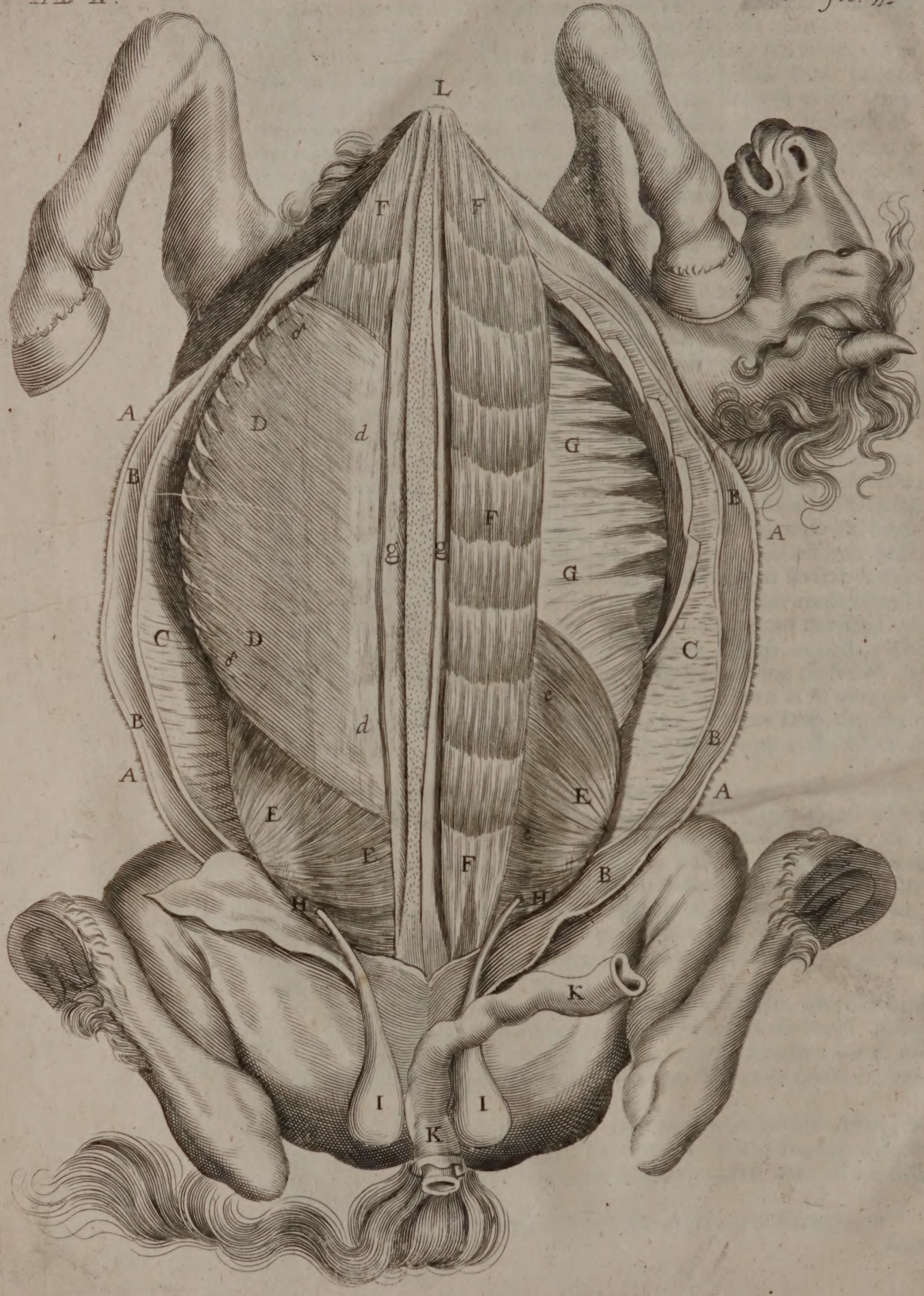
Their Original is from the one or two loweſt baſtard Ribs, the tranſverſe proceſſes of the Joints or *vertebræ* of the Loyns, and the Haunch-bones; and their Tendons reach to the white line, where they terminate.

Their Action. Their *Action* is to preſs the Guts for the expulſion of Excrements.

Now

TAB II.[d]

fol: 77.[th]



Now as each Muſcle has a peculiar action to it ſelf, which is that already aſcribed to each, ſo have all theſe ten Muſcles two Actions general to them all conjoinedly, which are theſe; The *firſt* is, that they ſerve for a defence or bulwark for all the Parts underneath them, and do by their fleſh (which pretty much aboundeth in them) cheriſh their natural heat and aſſiſt concoction; The *next* is, that they do all aſſiſt together in the compreſſing of the Guts for the voiding of the excrements, the Midriff aſſiſting thereunto, by whoſe help the excrements are thruſt downwards, which otherwiſe would be onely ſqueezed together, and not thruſt any more downward than upward. *The action of all theſe Muſcles together.*

I think it not amiſs in this place to explain what it is I call the *white Line*, for fear the naming of it ſo often as I have done in this Chapter, without ſhewing what it is, ſhould puzzle the Reader.

The *white Line* is nothing elſe, but the extremities or tendinous endings of theſe Muſcles of the Paunch, and is called *white* from its colour, becoming ſo, becauſe it conſiſts of Tendons and Fibres onely, wherewith no fleſhy part or particle is interwoven, whereby to change or alter the colour. It diſtinguiſheth the Belly into two parts, a right and a left, and is placed all along the middle of the Belly both below and above the Navel, running from the ſword-pointed Griſtle of the Breaſt as low as to the Share-bone. *The* white Line *what it is.*

Now the *Udder* being an external part of the Belly in Mares, I might in this place (in order) treat of it; but becauſe its Action, to wit the making of Milk, has ſo near relation to the Foal, for which it provides nouriſhment, I ſhall omit it in this place, and deſcribe it at the latter end of this *firſt* Book, after I have done with the generative parts of Mares, and the breeding, nouriſhing, *&c.* of the Young in the Womb.

The *Second* Table repreſenteth all the Inveſting parts of the *Abdomen*, as well proper as common.

AA *Shew the Skin and Scarf-skin turn'd back.*

BB *The fleſhy Membrane likewiſe turn'd back, with a little ſprinkling of Fat on its inſide.*

CC *The Common Membrane that inveſts the Muſcles; in like manner turn'd back.*

DD *The obliquely deſcending Muſcle expreſſed* in ſitu *on the right ſide.*

dd *The Tendon of the ſame running to the white Line.*

δδ *Its ſaw-like origine from the Ribs.*

EE *The obliquely aſcending Muſcle, with its Tendon* e e, *on the ſame ſide, likewiſe* in ſitu.

FF *The Streight expreſt to the full on the left ſide, but onely in part on the right, becauſe the Tendons of the obliquely deſcending, and aſcending Muſcles run over it.*

GG *The tranſverſe Muſcle expreſt to the full on the left ſide, but hid on the right by the two oblique.*

gg *The* white Line *and outer Skin of the Rim of the Belly cut in ſunder, that the Fat contained between the outer and inner Skin of the Rim may appear.*

HH *The perforations in the obliquely aſcending Muſcles, by which the ſpermatick Veſſels do paſs out of the* Abdomen *into the Cod.*

II *The Stones.* K *The Yard.* L *The* Sternum *or Breaſt-bone.*

CHAP. VII.

Of the Rim of the Belly, called the Peritonæum.

THE Muſcles of the Paunch being all removed, as alſo their Tendons which make the white Line before ſpoken of, the *Peritonæum* or Rim of the Belly comes next into ſight.

What the Peritonæum is. This *Peritonæum* is of a ſpermatick ſubſtance (as are all other Membranes or Skins) and is of an oval Figure, or like a long faſhioned Egg, for it compaſſeth all the Lower Belly and ingirts all the Parts therein contained, and alſo ſtrengthneth them, from whence it hath its name, from its office of *ſpreading* and *ſtretching about*. It is thin and ſoft, that it might not be either heavy or burthenſom; yet is it very ſtrong and compact, that it might be ſtretched without danger, when the Belly is full of Meat, or the Womb is full of the Burthen. Its inſide is ſmooth, and by reaſon of the Guts is daubed with moiſture; but its outſide is rough, which makes it ſtick ſo cloſe to the Muſcles that lie above it, that they can hardly be ſeparated, as I have before ſhewed.

Its original. It takes its *original* from the *vertebræ* or joints of the Loins, where it is very thick, and is therefore believed to proceed from the Membrane that inveſts the Marrow in the Back-bone, and is propagated from the double Membrane of the Brain. It is in all places double, and betwixt its Membranes I have always obſerved good ſtore of Fat, which Anatomiſts do not ſpeak of in other Creatures. The Veſſels run along this Fat between the Membranes, that they may be the better ſecured and defended, and may with more ſafety diſperſe their branches all over it; and for that purpoſe it is *perforated* in ſeveral places, ſo wide as is proportionably neceſſary to the largeneſs of the Veſſels that are to go through, and no larger, leſt in diſtentions or ſtrains they ſhould tear, as too apt they are to do, as Experience daily teſtifies in Men and Children, when vehement coughs or long and ſtraining cries do, in ſome, open the orifice of the Navel, and in others the orifices in the Groin, where the ſpermatick or ſeminary Veſſels go forth to the Stones, ſo that the wideneſs gives liberty for the ſmall Guts to fall out of their places into the outward parts, which cauſeth Ruptures and broken Bellies. The like I have ſeen in Horſes.

Its perforations.

The outmoſt Skins of all the parts of the Lower Belly, have their original from this. From the inner Membrane of this Rim of the Belly, all the outmoſt Skins or Coats which cover every Part contained in the Lower Belly do proceed, and from it have their original, ſome thicker and ſome thinner, according to the neceſſity or uſe of the Part reſpectively. As for Example, the Common Membrane of the Kidneys, the proper one of the Liver and Spleen (each of which have but one) are but very thin, for ſeeing they are never (naturally) extended, there was no neceſſity for their being otherwiſe; but the Common Skin of the Stomach, the Guts, the Bladder and the Womb are ſomewhat thicker, but much ſtronger and more compact, becauſe the uſes they are put to require it, that they may without danger be ſtretched, when there is occaſion. Now as the Entrails are many and of divers kinds, and alſo ſituated in ſeveral places different from one another, ſo does their outward Inveſting Membrane

take

take its original from that part of this *Peritonæum* or Rim of the Belly which is next to them; as the upper Entrails, which are the Stomach, the Liver, the Spleen, &c. borrow it from that part of the Rim which makes the under Membrane of the Midriff; ſo do the lower Entrails (as the Bladder, Womb, &c.) borrow it from that part of the Rim, which cleaveth to the Share-bone, it being the neareſt to them.

From this *Peritonæum* or Rim of the Belly do alſo proceed two double Membranes or Skins, which are thoſe of the Caul and of the Meſentery; as alſo ſeveral Ligaments, of which the moſt remarkable are thoſe of the Liver and Guts.

This *Peritonæum* is compoſed of membranous and nervous Fibres which are very ſmall. The Veſſels that are diſperſed through it are ſmall branches of Veins and Arteries which it hath from the Midriff, and other neighbouring Parts, as the Seminary and Mammary; and for Nerves, it hath them from the branches which are carried to the Muſcles of the Lower Belly. *Its Compoſition.*

Its *Uſes* are ſeveral, the firſt of which is, to cover and contain all the Parts or Entrails of the Lower Belly; ſecondly, to further the expulſion of the Excrements by preſſing the Stomach and Guts before and on the ſides, as the Midriff doth above. Again, it binds with its Ligaments all the Guts in their proper places by mediation of the Meſentery, that no violent motion (ſuch as running or leaping) ſhould move them out: By Ligaments proceeding from it, is the Liver alſo ſuſpended in its place. Its laſt uſe is to be a ſafeguard to the Veſſels that run through it, which being but ſmall and having a long courſe to run, would be in danger of breaking, were they not ſecured between its two Skins. *Its Uſes.*

CHAP. VIII.

Of the Omentum *or Caul.*

HAVING according to the order of diſſection, removed all the *inveſting* or *containing* Parts of the Lower Belly, and ſhewed which, and what they are; it now follows that I ſhew which are the parts *inveſted* or *contained.* And becauſe the *Caul* appears firſt in diſſection, I will firſt treat of it.

This *Caul* is in Latin called *Omentum*, from *Omen*, becauſe the Roman Soothſayers pretended by it to foretell things. It is alſo called *mappa ventris*, the Map or Diſh-clout of the Belly, becauſe it ſeemeth to lick up the ſuperfluities thereof. It doth cover all or moſt of the Guts in many Creatures; but in a Horſe it is moſt times removed from all the lower parts of the Belly, and lieth in wrinkles or folds near and about the Stomach. The reaſon of its being removed, I do ſuppoſe, is the hard labour and violent Exerciſe a Horſe undergoeth; for whilſt he is young, and before he comes to his labour, it is ſpread as far over his Entrails as in other Creatures, as hath been obſerved by the Learned *Marcus Aurelius Severinus*, who did in a She-foal which he diſſected at *Naples*, ſee the *The Caul what it is.* *How far it ſpreads over the Guts.*

Caul ſpread all over the Guts as far as to the bottom of the Womb, to which it was alſo joined with a ſtrait connection.

It is ſometimes the cauſe of barrenneſs. It ſometimes happeneth that the Caul falleth betweèn the bottom of the Bladder and the neck of the Womb in Women, and then it ſo compreſſeth the mouth of the Womb, that it leaveth very little or no paſſage for the Man's ſeed to enter in, which when it ſo happeneth is a cauſe of barrenneſs. But I believe no ſuch thing can happen in Mares.

Its connexion or origine. It is compoſed of two Membranes, the uppermoſt or formoſt of which ariſeth at the bottom of the Stomach to which it is faſtned, as alſo to the hollow ſide of the Liver and Spleen: The inner or backer Membrane ſprings from the *Peritonæum*, immediately under the Midriff towards the Back, and is tied to that part of the Gut *Colon* that paſſeth under the Stomach lengthways, as likewiſe to the Sweetbread and to the beginning of the ſmall Gut, next to the lower Orifice of the Stomach. Theſe Membranes are larded with plentifull Fat.

Figure. It is in figure like a Purſe-net, or Faulkner's Bag, conſiſting as is ſaid of a double Coat, ſeparate at the top, but knit together at the bottom, where it is round ſometimes, and ſometimes unequal, but at its upper part or orifice it is orbicular.

Its Veſſels. It has Veſſels of all ſorts, which do run through the ſubſtance thereof. It hath its Veins and Arteries from the Cœliacal and Meſenterical branches, and Nerves from a double branch of the Intercoſtal pair.

Its Fat. In Horſes it has much Fat, eſpecially in thoſe that are ſound and have not waſted it by either ſickneſs or long faſting, for in ſuch it conſiſts of little but the Membranes and Veſſels, the Fat ſerving for a ſubſidiary nouriſhment to the natural heat to feed upon when the Beaſt eats nothing. Now this Fat is not diſtributed equally to all the parts of the Caul, but runs here and there in ſtreaks accordingly as the larger Bloud-veſſels do, the ſpaces between being wholly membranous and ſeemingly tranſparent, ſo that it imitates a Net, whence in ſome Countries they call it ſo. Now the Fat adhering to and accompanying the Veſſels in this manner, it ſeems to be bred of an unctuous or oily part of the Bloud that ſweats through the Veſſels, but is detained by the cloſeneſs or denſeneſs of the Membrane, by whoſe reſpective coldneſs alſo it is curdled or congealed into Fat. But very unlikely it is that it ſhould be made of I know not what Vapours ſteaming out of the Parts contained in the Lower Belly, and condenſed by theſe Membranes; for not to mention the many abſurdities of this Opinion, if it were ſo bred, then would all the Membranes be evenly and equally beſmeared with it, which it is obvious to any Eye that they are not.

The uſe of its Fat. The uſe of this plentifull Fat is to cheriſh and heat the bottom of the Stomach, the upper part of which has no need of its warmth, it being covered with the Liver, whoſe Lobes hang over it and lie upon it. It ſerves alſo to moiſten the Guts, which have great need of being kept ſlippery and glib, that they may the better perform their continual periſtaltick motion.

The uſe of its Membranes or Skins. The uſe of the Membranes or Skins beſides their congealing and including the Fat, is to prop up and ſuſtain all the branches of the Veſſels which lie between and paſs through them, to the Stomach, the Spleen, the beginning of the ſmall Gut, and *Colon*, &c.

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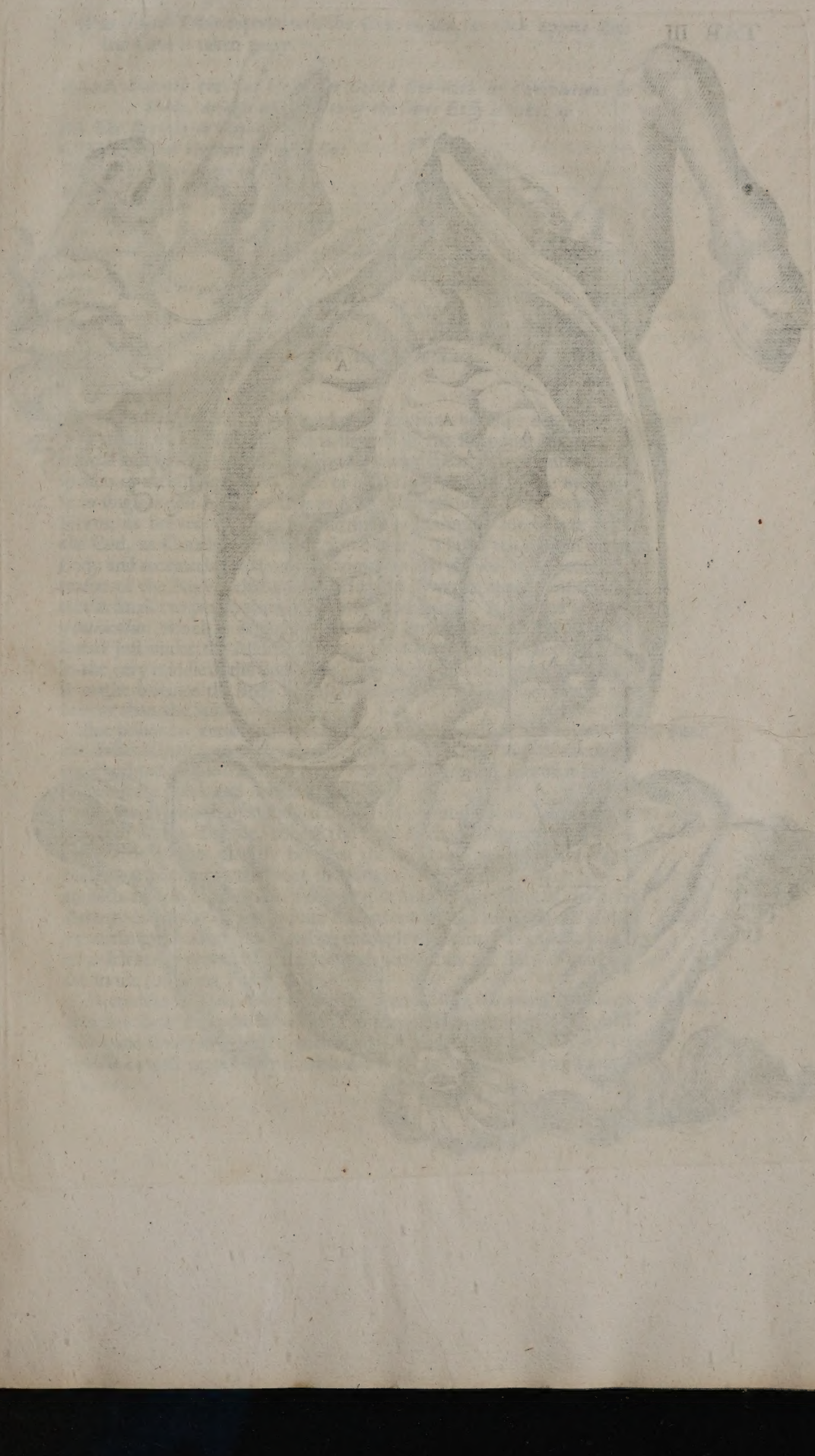

TAB III

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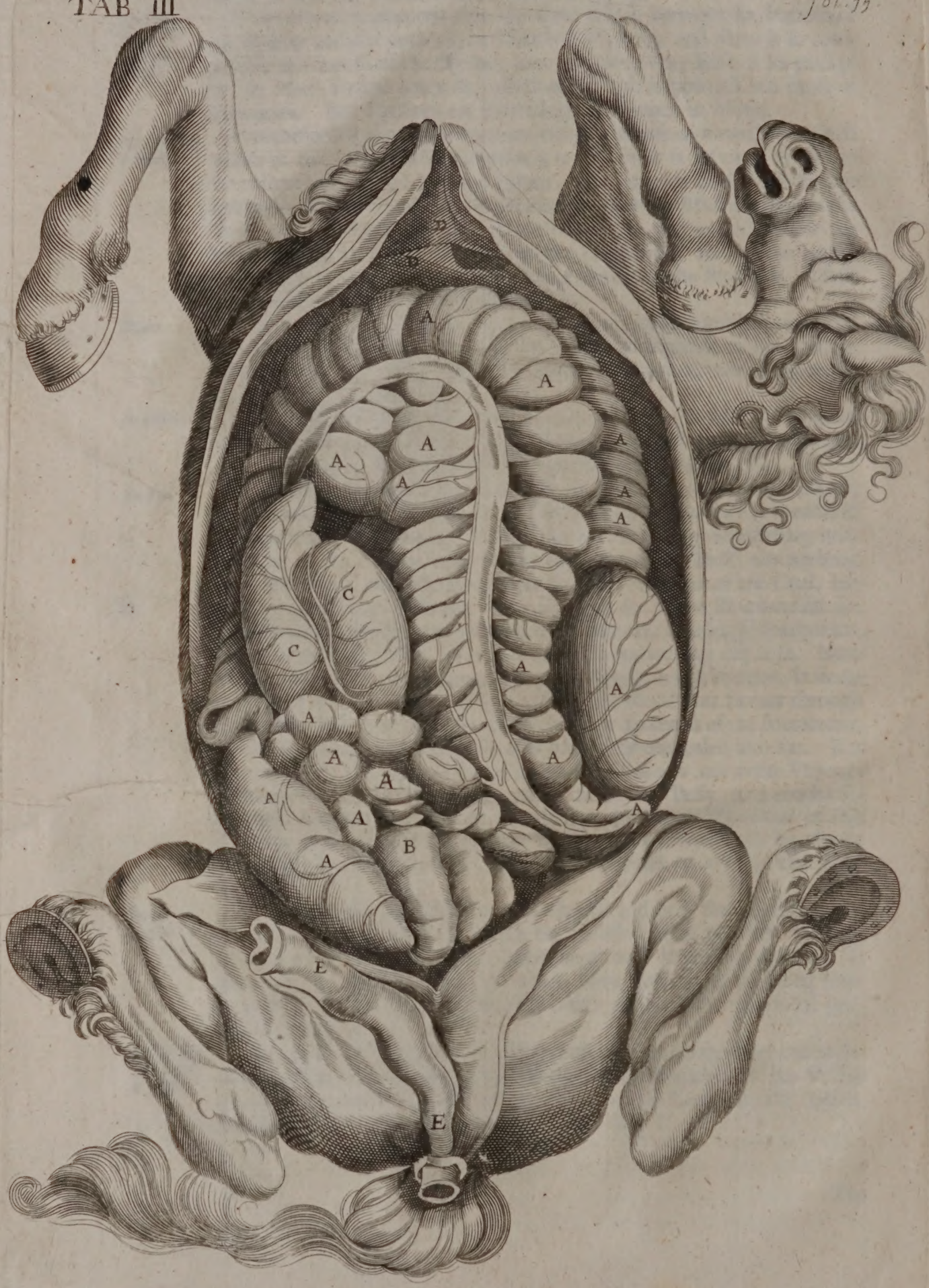
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The *Third* Table repreſenteth the Guts *in ſitu*, as they appear after the Caul is taken away.

AAAA *Sheweth the Gut* Colon *or Colick Gut with its Convolutions or Folds, as alſo what parts of the lower Belly it takes up.*
BB *The ſtreight or Arſe-gut.*
CCC *The Gut* Cæcum *or blind Gut.*
DDD *The Diaphragm or Midriff.*
EE *The Horſes Tard.*

CHAP. IX.

Of the Gullet and Stomach.

AFTER the Caul is removed, the Inteſtins or Guts do appear in their natural ſituation, as is ſhewed in the foregoing Figure; but there is another Part that lies abſconded under them, which muſt firſt be ſpoken of according to the order of diſſection, and that is the Stomach. It is ſingle in an Horſe as it is in Man, though ſuch Creatures as have Horns, as Beeves, Sheep, &c. and ſuch as having no Horns yet chew the Cud, as Camels, Hinds, &c. have four. This is the Kitchin of the Body and receptacle of Meat and Drink; as alſo the ſeat of Appetite, by reaſon of the Nerves that are diſperſed chiefly in its upper Orifice, but run in ſmall twigs alſo through its whole ſubſtance. It is called in Latin *ventriculus*, which is as much as to ſay a little Belly; and is placed or ſeated juſt under the Midriff between the Liver and the Spleen, almoſt in the very middle of the Body, inclining a little towards the left Side that it might ballance the Body againſt the Liver, which is much bigger and heavier than the Spleen.

The Gullet. But before we enter upon the Stomach it is convenient firſt to deſcribe the *Gullet* which is an Appendage to it, and ſerves as a Tunnel to convey the Food out of the Mouth into it, though the greateſt part of it be contained in the Neck and Breaſt.

Its origine and deſcent. It is an organical or diſſimilar Part, hollow and round, beginning at the root of the Tongue, behind the head of the Windpipe, and paſſeth down from thence directly between the Windpipe and the Joints of the Neck and of the Cheſt, about the fifth or ſixth Joint of which latter it turneth a little to the right ſide, to give way to the trunk of the great Artery, but about the ninth Joint it turns toward the left again and climbs upon the great Artery, and paſſing through the Midriff at an hole proper to it ſelf it is inſerted into the Stomach toward its left ſide, as you may ſee in the following Figure.

Its ſubſtance. It conſiſts of three Membranes or Skins. The *outermoſt* is *common*, which it hath from the *Pleura* or from the ligaments of the Joints of the Neck and Breaſt on which it reſteth: This inveſteth the two *proper*. The *middle* or firſt proper one is thick and fleſhy, conſiſting of two ranks of fleſhy

fleſhy Fibres, obliquely or ſlopingly aſcending and deſcending, ſo that they croſs one another like an X. The innermoſt or ſecond proper is membranous, and hath onely ſtreight Fibres.

Its Veſſels. It has *Veins* in the Neck from the Jugulars, in the Breaſt from the *Vein without a fellow*; and where it is joined to the Stomach, from the coronary branch of the *Porta*. *Arteries* in the Neck it has from the *Carotides*, in the Breaſt from the Intercoſtals; and where it joins to the Stomach, from the cœliack coronary branch. It hath *Nerves* from that pair that is commonly called the ſixth.

Its Kernels. It has two notable Glands or Kernels at its beginning in the Throat, called Almonds from their ſhape, which ſeparate a kind of flegmatick humour to keep the inſide of the Gullet moiſt and glib, that the Food may eaſilier deſcend down by it.

Its Uſe. Its *uſe* is, to convey Meat after it is chewed in the Mouth, as likewiſe Drink, down into the Stomach, there to be turned into chyle.

The Stomach. Having done with the Gullet, we now return to the *Stomach*.

Its figure, Its *figure* is round and ſomewhat long, reſembling a Bag-pipe; though on the left ſide and at the bottom it is bunching and more capacious than on the right ſide; for there it is by little and little narrowed that it might give place to the Liver.

And magnitude. Its *magnitude* is divers according to the largeneſs of the Horſe, or according to the quantity of Meat or Drink (be it little or much) that is in it; for it contracteth or diſtendeth it ſelf as there is occaſion. As for example, if there be a great quantity of Meat and Drink let into it, it doth extend it ſelf to that largeneſs as to contain it; and as that Meat is by little and little concocted, and then let forth through the lower Orifice into the ſmall Guts to be there ſuckt up by the milky Veins, the Stomach doth accordingly by little and little contract or draw it ſelf up ſo cloſe to that which remains, that it embraceth it on all ſides, ſo that there is never any cavity or hollowneſs to ſpeak of to be found in the Stomach; whence we ſee in Tripes, that the inſide is by ſuch contracting always rugged or in wrinkles, whereas the outſide is ſmooth and plain. Onely this we may note as to its bigneſs, that in conſideration of the bigneſs of an Horſes Body or the largeneſs of his Guts, it is far leſs in him than in moſt Animals.

Its Orifices. The Stomach hath two *Orifices*, a left and upper, which is to receive in Meat; and a right which is the lower, to let it out after concoction. The firſt being the uppermoſt I will firſt ſpeak of, which is much wider and larger than the other, becauſe it admits the Meat, many times not half chewed, into the Stomach (and for that cauſe is much thicker and alſo ſtronger than the other) whereas all is reduced into a fluid ſubſtance, before it paſs out at the other.

The upper and left Orifice of the Stomach. This Orifice being a continuation of the Gullet is called the *mouth* of the Stomach, and hath an exquiſite ſenſe of feeling becauſe of the Nerves which encompaſs it, and by which it the ſooner perceives the emptineſs and want of Meat, and therefore ſtirs up the Horſe to ſeek Food to ſatisfy his want. It is near the middle of the Stomach, and not ſo near the left ſide of it as in Men.

Its Uſes. It is furniſhed with fleſhy and circular Fibres, that it may naturally ſhut up and ſtraiten it ſelf after the Meat is received in, and alſo may intercept or hinder the Vapours from coming forth, which would by their aſcent up to the Brain be very injurious, by breeding diſeaſes and evil

diſtempers

diſtempers in the Head; which Vapours would be alſo wanted in the Stomach to further concoction: for as it is an uſual cuſtom when Meat is over the fire for the Pot-lid to be put on to keep the Vapours or Reek from coming forth; ſo likewiſe it is requiſite in this caſe that the Vapours of the Stomach ſhould be kept in, that Concoction ſhould be thereby furthered, or the Food be ſooner digeſted, the Vapours aſſiſting thereunto.

The lower Orifice, and its office.

The lower and right Orifice is called *pylorus*, which is to ſay, the Porter, from its office, which is to open and ſhut as occaſion ſerves; to open, when the chyle is let forth and ſent into the Gut *duodenum*, and then to contract or draw it ſelf cloſe up again, that nothing may paſs through it which is not fully concocted. Which contraction is performed by tranſverſe or overthwart Fibres, with which it is plentifully furniſhed for that purpoſe; as alſo a thick and compact circle doth encompaſs it round, which circle is in ſhape like the ſphincter Muſcle of the Fundament. By theſe Fibres and this Circle the action of the Porter, or lower Orifice, is performed, that is to ſay, it is either opened or ſhut, widened or ſtraitned as there is occaſion, as I have ſaid before. And theſe are the offices of the Orifices of the Stomach.

The compoſition of the Stomach.

Now I proceed to the *compoſition* of it, which is of three Membranes or Skins, the firſt or outmoſt of which it hath from the *Peritonæum*, or Rim of the Belly. The ſecond and middlemoſt is more fleſhy than the former, conſiſting of fleſhy Fibres, which do mightily ſtrengthen the Stomach and by their heat do further concoction. The third and inmoſt is nervous, into which all the Veſſels do terminate or end. This Coat or Skin is continued with the Gullet up to the Mouth, that the Mouth ſhould not admit or receive in any thing that is offenſive to the Stomach.

Its Veſſels. *1. Veins.*

The Stomach is furniſhed with *Veſſels* of all ſorts. *Veins* it hath *firſt* from the Splenick branch, as 1. The *vas breve*, or ſhort Vein, which is inſerted into the bottom of the Stomach, whence afterwards it creeps up between the Coats towards the upper Orifice, but is obliterated before it comes quite to it. 2. The two Gaſtrick Veins (the greater and leſs) which creep along the bottom of the Stomach, and in their courſe ſpread many branches into it; but the largeſt branch of the greater of theſe two is that which is called the Crown-vein, that encompaſſes the upper Orifice of the Stomach. 3. A Vein that is common to the left ſide of the Stomach and the Caul. *Secondly*, it hath another common to its right ſide and the Caul, from the Meſenterick branch. And *laſtly*, its lower or right Orifice has a ſmall Vein from the trunk of the *Porta* it ſelf, which is called *pylorica* or Porter-vein. Now before the circulation of the bloud was found out, it was believed that all theſe Veins brought bloud to the Stomach for its nouriſhment: but ſince that was diſcovered by Dr. *Harvey*, every one knows that they carry nothing to the Stomach, but bring back from it ſo much of the Arterial bloud as is not ſpent upon its nouriſhment. But beſides the bloud ſome learned Men have entertained an opinion that they ſuck out of the Stomach a thinner and more ſpirituous part of the chyle, which paſſes along with the bloud to the Heart by a far ſhorter paſſage than if it deſcended into the Guts and entred into the milky Veins, *&c.* (as ſhall afterwards be fullier declared.) And this they think it reaſonable to ſuppoſe, becauſe of the ſudden and quick refreſhment that Creatures receive from Cordial Drinks, and the like. I ſhall not

not pretend to decide the controverſie betwixt thoſe that affirm this, and others that deny it, but do think this opinion to be very probable, becauſe of the very ſpeedy revival of Horſes (that I have obſerved) which being ready to faint away, have ſuddenly grown brisk upon the giving them ſome comfortable draught: unleſs we ſhould think with ſome, that the Nerves of the Stomach do imbibe ſome ſpirituous parts of ſuch potions, and ſo the refreſhment ſhould come that way.

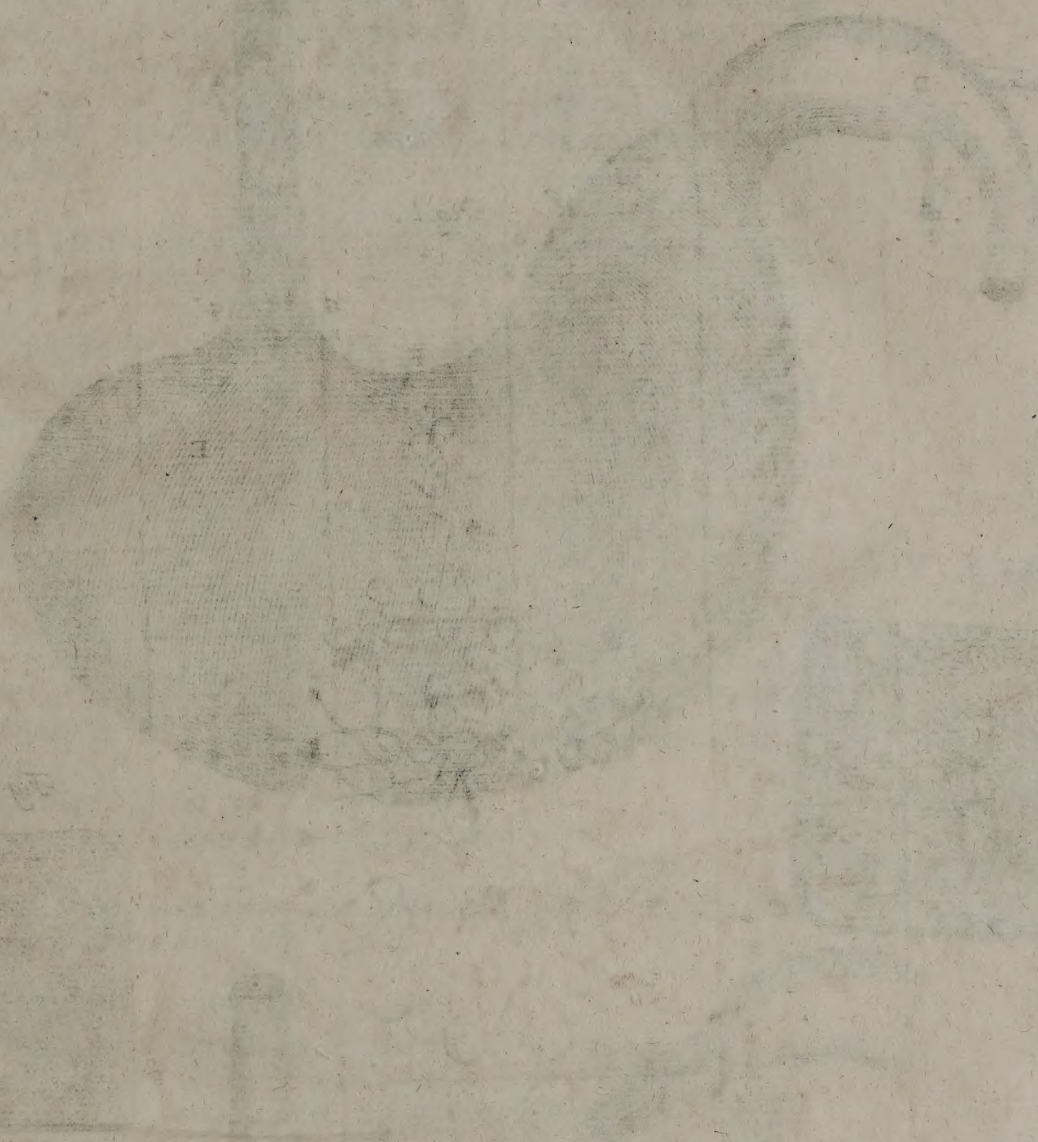
2. *Arteries.* The Stomachal *Arteries* are twigs from the Cœliacal branch of the *Arteria magna* or great Arterie, and theſe do accompany the Veins in all their courſe, and beſtow nouriſhment and vital heat upon it. For the Stomach is not nouriſhed with the Chyle, any more than any other part, but with arterial bloud which by theſe Arteries is brought from the Heart.

3. *Nerves.* It hath two notable *Nerves* from the ſixth pair (reckoned by Dr. *Willis* to be the eighth) propagated from thoſe branches which make the recurrent Nerves. Theſe do encompaſs the upper Orifice, and then are carried, in oblique or ſlanting lines, croſs one another over moſt part of it; the right branch compaſſing the foremoſt and left part, and the left branch compaſſing the hindermoſt and right part thereof.

Its Action. The Stomach has ſeveral *Actions*, as firſt Hunger and Thirſt, which are the ſenſe that it has of the want of Meat and Drink, and an Appetite that is excited in it for the obtaining of them. Secondly, it has an action of retention, whereby it contracts it ſelf cloſe about the Food that is taken in, and detains it ſo long till it is throughly concocted or turned into a thin juice called Chyle. Thirdly, it has a motion that is called periſtaltick, ſuch as the Guts alſo have, reſembling the motion of a Worm, whereby its parts contracting themſelves ſucceſſively from above downwards, thruſt out the chyle into the Guts gently and by degrees. But the chief and moſt conſiderable action of the Stomach, is, fourthly, Chylification, or turning the aliment into a whitiſh liquor commonly known by the name of Chyle, which being expelled out of the Stomach into the Guts, is, the *thinner* part of it, ſuckt up by a ſort of Veſſels called *milky* Veins, (ſo called from that colour which this liquor gives them) that are inſerted every where into the Guts, and which carry it towards the Heart, by thoſe ways that hereafter ſhall be deſcribed: but the thicker and more dreggy part is driven along the Guts and caſt out at the Fundament as excrement.

How it concocts. Now there are ſeveral things that concur to this laſt and principal action of the Stomach, *viz.* Concoction. As *firſt*, the very numerous Arteries that are diſperſed through it which much foſter and encreaſe its *heat*, which though it be not the main inſtrument of concoction, yet much furthers it. And this heat is alſo encreaſed by the Liver which covers the upper and fore-part of its right ſide, as alſo by the Caul which by its two Membranes inveſts its bottom. But *ſecondly*, that to which concoction is mainly owing is a certain ferment in the Stomach, which is compounded *partly* of the ſlaver with which the Horſes mouth always abounds for the moiſtening and ſoftning of his Meat while he chews it, and part of which is continually ſwallow'd down into his Stomach together with the Food; and *partly* of an acid or ſharp and ſalt liquor bred in the Stomach, as is moſt likely, of ſalt and acid ſteams evaporating out of the ſtomachal Arteries, and condenſed in it into this juice: And this liquor is that which diſſolves and melts as it were the ſolid Meats that are

ſwallowed



TAB. IV

pag. 19.

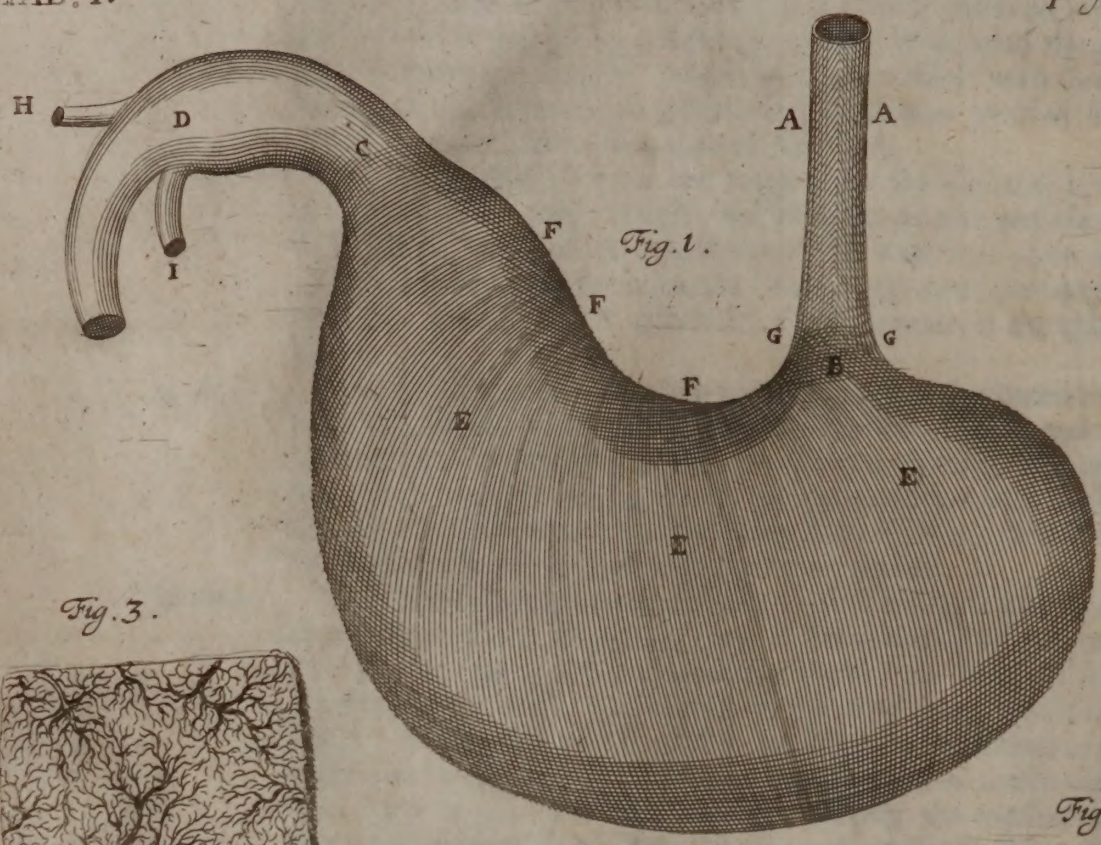


Fig. 1.

Fig. 3.

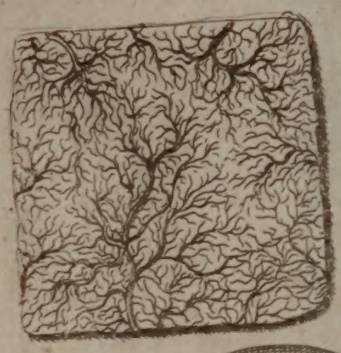
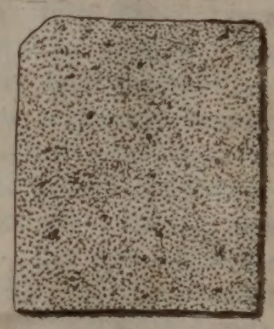


Fig. 4.



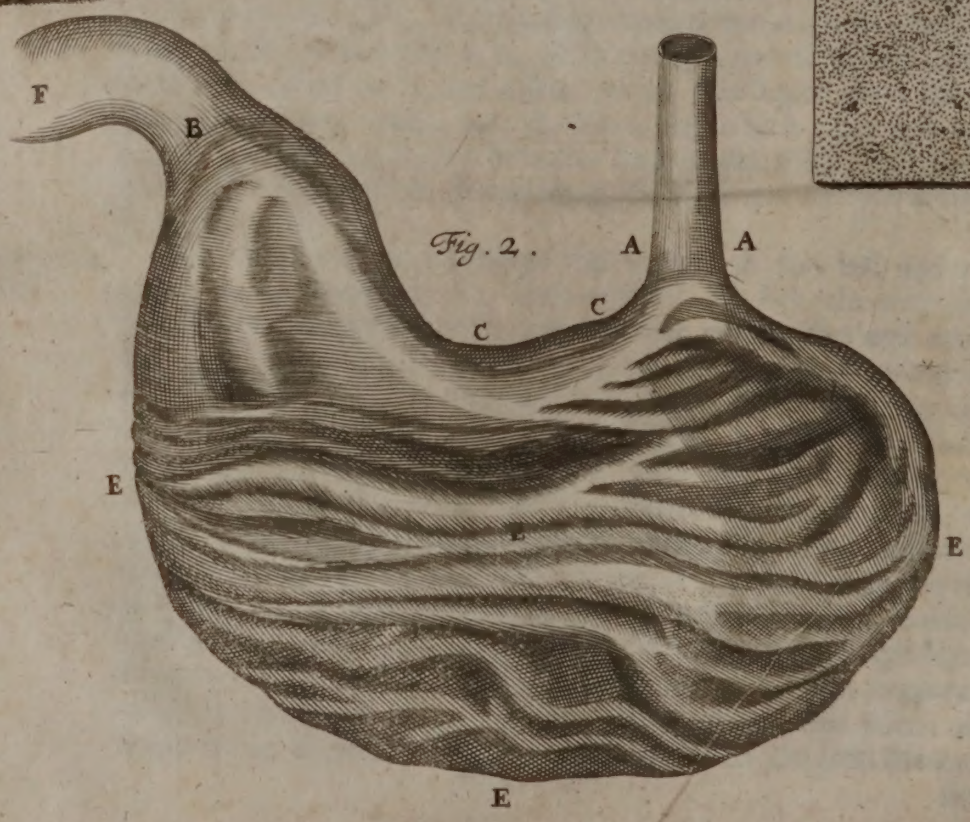


Fig. 2.

ſwallowed (ſomething like as *Aqua fortis* diſſolves Steel) and reduces the whole maſs into fluid ſubſtance, which then paſſes down into the Guts, as aboveſaid. This acid Juice was formerly thought to come from the Spleen by a Vein called *the ſhort Veſſel*; but later Anatomiſts have diſcovered from the circulation of the Bloud, that that Vein brings nothing from the Spleen to the Stomach, but contrariwiſe carries the Bloud, that is ſuperfluous to the nouriſhment of the Stomach, from it into the ſplenick Vein, by which it goes to the Liver, and from thence to the Heart in its circulation. So that no ſuch original or ſpring of this ferment is to be imagined.

The *Fourth* Table expreſſeth the ſecond or middle, and the innermoſt Coats of the Stomach.

Fig. I. Sheweth the Stomach freed from its outmoſt nervous Coat, that the outer or convex ſurface of the middle Coat may appear with its fleſhy Fibres.

AA *The Gullet.*
B *The Mouth or upper Orifice of the Stomach.*
C *Its lower Orifice called* Pylorus.
D *A portion of the ſmall Gut.*
EEE *The circular Fibres encompaſſing the Stomach depthways.*
FFF *The top or upper part of the Stomach, where theſe Fibres ariſe.*
GG *The circular fleſhy Fibres that encompaſs the upper Orifice or Mouth of the Stomach, which contracting themſelves ſhut or purſe it up as occaſion ſerves.*
H *The Gall-paſſage inſerted into the ſmall Gut.*
I *The Pancreatick duct inſerted into the ſmall Gut.*

Fig. II. Sheweth the Stomach turned inſide out, that its woolly cruſt with its wrinkles and folds may appear.

AA *The left Orifice or Mouth of the Stomach.*
B *The right or lower Orifice, to which the ſmall Gut is knit.*
CC *The top or ſummity of the Stomach between its two Orifices.*
EEEE *The ſides, ends and bottom of the inſide of the Stomach, with its woolly cruſt and wrinkles or folds.*
F *A portion of the ſmall Gut.*

Fig. III. Repreſents a piece of the inmoſt nervous Coat, wherein the woolly cruſt being taken off, the inner or concave ſurface with a very thick ramification of Veſſels doth appear.

Fig. IV. Shews a piece of the woolly cruſt, which looks like a fourth Coat, wherein its outer ſurface, whereby it ſticks to the nervous Coat, appears very full of glands and the mouths of Veſſels.

CHAP. X.

Of the Guts in general.

The Guts. Their Name, Figure and Length.

THE Guts are called in Latin *Inteſtina*, becauſe they are placed in the inmoſt part of the Body, as you ſee them placed in the Third Figure, which ſhews their natural poſition or ſituation, they taking up the moſt part of the cavity or hollowneſs of the Lower Belly. They are oblong, round, hollow Bodies, in number ſix, and are bigger or leſſer as is the bigneſs of the Horſe. They are the Inſtruments of diſtribution of the Chyle and expulſion of the Ordure, being continued with the *Pylorus* or Porter of the Stomach and reaching to the Fundament. They are in length about thirty ſix yards, a little under or over according to the largeneſs of the Horſe; wherefore they are neceſſarily girded and wound into manifold convolutions or folds, that the cavity of the Lower Belly might be capable of containing them, which otherwiſe it could not do.

How knit together.

They are gathered up and entwiſted in the folds of the Meſentery, by which coming between they are alſo knit to the Back: all which is to keep them from falling out of their places or rolling upon one another, which would have often hapned, had not Nature ſo well provided for the contrary, eſpecially in violent exerciſe, as hunting, running, leaping and the like; and if it had hapned, the weight of the one lying upon the other would have obſtructed the paſſage of the Excrements, and ſo caus'd exceſſive pains, as gripings, ſtrainings to dung, and the like, and upon the continuance of ſuch ſtoppage, death it felt.

The Guts are on the outſide moſt times fat, but on the inſide they are covered with a ſlimy or ſnotty ſubſtance, for the more free and glib paſſage of the Dung.

Their Coats.

They have *three Coats*, like as the Stomach hath. The *outermoſt* or common one is nervous, ſpringing mediately from the Rim of the Belly, but immediately from the Membranes of the Meſentery; ſaving that of the beginning of the firſt Gut, and of that part of the *Colon* which runneth under the Stomach, where it immediately proceedeth from the Caul adhering to thoſe Parts. The *middle* is thicker and fleſhy, having two ranks of Fibres, the outer of them ſtreight, and the inner tranſverſe or overthwart. The *innermoſt* is alſo nervous like the outmoſt, but on its inſide it is cruſted over with a kind of ſpongy ſubſtance, that ſerves as a ſtrainer for the Chyle to paſs through out of the Guts into the milky Veins. This Coat has all ſorts of Fibres, and is very wrinkled, to prevent the too quick gliding away of the Chyle. The Fibres of this and the middle Coat ſerve to perform the periſtaltick or worm-like motion of the Guts, by which whatſoever is contained in them is gently driven along downwards towards the Fundament.

Veſſels. *1. Veins.* *Viz. firſt, Bloud-veins.*

The Guts have all ſorts of Veſſels. As 1. *Veins*. Theſe they have from ſeveral branches of the *Porta*, but the moſt come from that branch of it that is called the Meſenterick. The uſe of which Veins was by the Ancients thought to be, both to carry Bloud to them from the Liver for their nouriſhment, and to bring back from them the Chyle to the Liver, there

there to be turned into bloud. But as to the firſt, the circulation of the Bloud makes it evident, that they carry no bloud to the Guts, but all that is contained in them, is received from the Arteries that are inſerted into the Inteſtins, and returns by them to the Liver, through which it paſſes into the Vein called *Cava*, and by it aſcends to the Heart. And as to the latter uſe aſſigned to theſe Veins, namely the bringing of Chyle from the Guts to the Liver, there was another ſort of Veſſels found out by one *Aſellius* about threeſcore years agoe, that perform this office, called by him (from their colour) *milky Veins*. But neither do theſe conveigh the Chyle to the Liver, as the firſt Inventor of them thought, but running from the circumference of the Meſentery they unite and diſcharge themſelves into one common receptacle near its centre at the Back-bone, from whence the Chyle paſſes up along the ſide of the Back-bone as high as the Collar-bone by a proper pipe, where it is emptied into the ſubclavian Vein, in which being mixed with the Bloud it glides along with it immediately into the Heart. I ſay then the uſe of the Bloud-veins of the Guts, is onely to receive ſo much of the Arterial bloud as is ſuperfluous from their nouriſhment. *Secondly, milky Veins.*

A *ſecond* ſort of Veſſel diſperſed through the Guts are the *Arteries*, which ſpring partly from the Cœliack branch, and partly from the Meſenterick. Theſe afford both Vital heat and nouriſhment to the Guts, and beſides upon adminiſtring a Drench to ſcour your Horſe, they diſcharge the impurities and bad humours flowing in the maſs of bloud, into the Guts, to be thrown out in the draught. 2. *Arteries.*

3. Their *Nerves* are from that pair that has commonly been called the ſixth, but according to Dr. *Willis*'s diſtinction is now generally reputed for the ninth pair, and otherwiſe called the *Intercoſtal*, becauſe as it deſcends down the Cheſt, it ſends out a ſmall twig between every Rib. Theſe contribute to the Guts their ſenſe of feeling, and furniſh their Fibres with animal Spirits, whereby they are enabled to perform their worm-like motion. 3. *Nerves.*

As for the *milky Veins*, we have mention'd them before, and ſhall treat further of them in the Chapter of the *Meſentery*.

CHAP. XI.

Of the Guts in particular.

NOW though the Guts be one continued Body from the lower Oriſice of the Stomach to the Fundament, yet they are wont to be diſtinguiſhed into ſeveral; In Men they are divided into ſix, three ſmall, and three thick: but in a Horſe we cannot ſo well follow this diviſion, there being not any difference in the ſmall Guts ſo conſiderable as to ground a diſtinction upon. However, becauſe the ſecond of the thick Guts ſeems to have three partitions, we ſhall make three of it, and ſo will they anſwer to the number in Men, and be reckoned *ſix*. *The Guts are in number ſix.*

1. *The ſmall Gut.*

The firſt we ſhall diſtinguiſh onely by the name of the *ſmall Gut*. This is twenty ſix or twenty ſeven yards in length, ſomething narrower at a foot and half diſtance from the Stomach than towards its ending, but through the whole it is wider than in an Oxe, being about two inches or two and an half over. Preſently at its beginning it bends under the Stomach towards the Back-bone, ſtreight along which it deſcends a pretty way, being annexed firmly to it by a ſtrong Membrane (that ſeems to be borrow'd of the Caul here knit to it) which is all the eſtabliſhment it has. But by and by it leaves this hold, and beginning to wind about, is received into the folds of the Meſentery, whereby it is admirably kept from twiſting and entanglement. Now there are far more of the *milky Veins* inſerted into this Gut than into all that follow; and beſides thoſe Veſſels which are common to it with the thick Guts, namely Veins, Arteries and Nerves, it has two other Veſſels inſerted into it, one from the Liver and another from the Sweet-bread. By the firſt is yellow Choler, and by the latter a peculiar Juice from the Sweet-bread (called the *pancreatick Juice*) diſcharged into it. Theſe two Liquors flowing into it from the aforeſaid Bowels about a foot below the Stomach, within an inch or two one of another, make a notable ferment in it, which mixing with the Chyle that is paſſing down this way, cauſes it alſo to ferment, whereby it comes to work it ſelf ſomething clearer, as I may ſay, even as Ale or Beer in a Barrel does. For by this fermentation the impurer and more earthy or dreggy part of the Chyle, is ſeparated and precipitated as it were from the more pure and ſpirituous, whereby this latter part is made capable of being received in at the ſmall mouths of the milky Veins that gape in abundance into this Gut, whilſt the thicker and excrementitious part is thruſt along the Guts by their worm-like motion, and makes the Dung. This Gut for about two hands breadth at its beginning from the *Pylorus* is wider, and for the like ſpace at its end before it is joined to the following, is a little narrower, than in its other parts.

2. *The* Cæcum *or blind Gut.*

Having done with the *ſmall Gut*, we next come to the *thick* ones, in number five, of which the firſt is called *Cæcum* or the *blind Gut*, becauſe it has but one paſſage for the Excrements both into and out of it, which come into it out of the ſmall Gut, and go out of it into the next thick Gut. It is not round in ſhape like the ſmall Gut, but as it were four-ſquare, which figure it comes to have from four Ligaments that run along it, one on each ſide, which contain it in that ſhape; and theſe Ligaments being ſhorter than its Coats, make them bag out in many Cells as the *Colon* does in other Creatures. It is almoſt a yard long, and unequal in breadth: for though at its mouth, where it joyns to the ſmall Gut and the *Colon*, it be near a quarter of a yard over, yet towards its cloſe end it grows ſo by degrees narrower, that it is not above three inches. This Gut is very inconſiderable for its bigneſs in moſt Creatures, particularly in Man, in whom it is not ordinarily above four inches long, and hardly ſo thick as ones little Finger: onely in a Rabbit it bears much the ſame proportion with the reſt of the Guts, as it does in an Horſe. In ſuch Creatures as have it ſo very ſmall, its uſe is very obſcure; but in an Horſe where it is ſo very large, its uſe is apparent to be, to ſtay the too quick paſſage of the Excrements by receiving them into it ſelf as it were into an Inn, whereas if they kept directly the ſtreight Road of the reſt of the Guts without turning in here, they would come too ſoon to their journeys end, namely the Fundament: I mean the Horſe would be continually a-ſcouring,

a-ſcouring, and ſo fall from his fleſh and languiſh, by reaſon that the *milky Veins* would not have time to ſuck up all the Chyle out of the Guts to turn into his nouriſhment; beſides that it would be troubleſome to the Horſe, and offenſive to his Rider to have him always a-dunging. Its connexion to the ſmall Gut and *Colon* you may better conceive of by the following Figure, in which it is well expreſſed, than by my deſcription of it in words.

That which is the ſecond thick Gut and in Man is called the *Colon*, ſeems in an Horſe to be divided into three, to which I ſhall not take upon me to aſſign diſtinct names, but onely call them three *Colons*. The *firſt* of them is about a yard and a half in length, and for the moſt part of it a quarter of a yard over. The *ſecond* is as wide as the firſt, but onely about a yard in length. Theſe two are divided one from the other by a narrow *neck* about half a yard long, and four inches over. The *firſt* of theſe two wide *Colons*, is that which in its upper part joyns with the blind Gut above deſcribed, where it has a Valve, conſiſting of a looſe Membrane or Skin that hangs round its mouth, which permits any thing to come into the *Colon* out of the *Cæcum* or out of the ſmall Gut, but when any thing would paſs out of that into theſe, then the edges of this looſe Skin flap cloſe one againſt another and hinder it, whereby Nature has prevented the return of the Excrements back out of the *Colon* into the ſmall Gut. And the lower end of the *latter* of theſe two wide *Colons* joins to the *third*, which is very narrow in compariſon of *them*, but yet is more than twice as long as both of them, namely about ſix yards. Now all theſe three *Colons* are contracted into Cells by two Ligaments, one of which runs along the upper part, and the other on the lower ſide of them: and beſides theſe two which are common to them all, the larger ones have ſomewhere other two that run along their ſides, but eſpecially ſo has the Neck that divides them whereby it is made fourſquare like the blind Gut. The reaſon why theſe *Colons* (as well as they are in other Creatures, and the *Cæcum* alſo in this) are contracted into Cells, is for the ſlower paſſage of the Excrements, that what of the Chyle was not drunk in by the milky Veins of the ſmall Gut, might be leiſurely ſuckt up by thoſe that are inſerted into theſe thick ones; for though we call their Contents *Excrements*, yet that is onely becauſe the much greater part is ſo, for all the Chyle is not clear imbibed from them till they come towards the end of the laſt *Colon*, though the milky Veins are not a tenth part ſo numerous in theſe as in the ſmall Gut.

Three Colons.

To the lower end of the ſmall *Colon* is joined the laſt Gut called *Rectum* or the *ſtreight* Gut, becauſe it runs ſtreight along without any windings. It is alſo called the *Arſe-gut*, becauſe it reacheth to the Fundament. The Coats of this Gut, eſpecially the middle, are much thicker than any of the other, and the whole ſeems fleſhy and muſcular. It is but about half a yard long, and betwixt three and four inches over. This is not gathered in the foldings of the Meſentery, but inſtead of that, is from its beginning at the lower end of the Loins, to its ending at the Arſe-hole, faſt tied by a Membrane to the Back and Rump-bones, which keep it from falling out upon ſtraining to dung. At its lower end at the Arſe-hole it has a round Muſcle that encompaſſes it, called the *ſphincter* Muſcle, whereby it is purſed up ſo, that nothing can paſs out, except when the Beaſt looſens it of his own accord when he goes to dung, and then at the ſame time he ſqueezes the Guts by help of the Muſcles that environ his Paunch,

6. The ſtreight Gut.

Paunch, which we deſcribed above in *chap. 6.* and ſo forces the Dung to iſſue out at the Fundament.

And thus we have finiſhed the Hiſtory of the Guts, not needing to add any thing of the uſe of them, becauſe their uſe is all along interwoven in their deſcription, and therefore we ſhall paſs on to the other parts.

The *Fifth* Table repreſenteth the Gullet, Stomach and Guts taken out of the Body.

A *The Gullet.*
B *The upper Orifice of the Stomach.*
CC *The two external Nerves of the ſixth pair (otherwiſe reckon'd for the eighth) diſperſed through the upper part of the Stomach.*
DDD *The three different Coats of the Gullet, a little turned down, to ſhew them the plainer.*
E *The lower Orifice of the Stomach called the* Pylorus.
F *The outermoſt Coat of the Stomach turned back.*
G *The entrance of the* porus bilarius *or Choler-paſſage into the beginning of the ſmall Gut.*
H *The entrance of the pancreatick duct or paſſage of the Sweet-bread into the ſame Gut.*
IIIIIII *The ſmall Gut.*
K *The* Inteſtinum cæcum *or blind Gut.*
LL *The firſt* Colon.
M *The ſmall neck that divides the firſt* Colon *from the ſecond.*
NN *The ſecond or middle* Colon.
OO *One of the Ligaments that contracts the blind Gut and* Colons *into Cells.*
PP *The third and laſt* Colon, *far ſmaller than the two former, but longer.*
QQ *The* Inteſtinum rectum *or Arſe-gut.*
R *The two Muſcles called* levatores Ani, *or openers of the Fundament.*
S *The ſphincter Muſcle that contracts or purſes up the Arſe-hole.*
T *The middle Coat of the Stomach through which the two branches of Nerves are diſperſed.*
U *The third or inmoſt Coat of the Stomach.*
XX *The branchings of the Bloud-veſſels, as they appear on the outſide of the Stomach.*
YY *The ſeveral Gaſtrick Veſſels inſerted into the bottom of the Stomach.*

CHAP.

TAB V

fol. 24.

CHAP. XII.

Of the Meſentery.

THE *Meſenterium* or *Meſentery* is ſo called from its being placed in the middle of the Guts, which it embraces round, gathering them together in form of a Globe, but is it ſelf gathered into folds. This Meſentery is of a circular figure, compoſed of a double Coat, between which do run many Veſſels and thoſe of all ſorts, and betwixt which alſo there is a collection of much fat. Dr. *Wharton* ſays that in *Man* there is a third Membrane betwixt the two commonly known, in which are ſeated the Glands or Kernels, and through which the Veſſels run. If ſo, 'tis likely there is the ſame in an *Horſes* Meſentery, which abounds with Glands. 'Tis a little above a quarter of a yard broad from its centre to its circumference. *The* Meſentery *why ſo called.*

Now its *centre* or *riſe* is at the firſt and third Rack-bone of the Loins, where membranous Fibres are produced from the Rim of the Belly, and ſpread into the two inveſting Coats or Skins of the Meſentery. *Its riſe.*

The *fat* with which theſe Membranes are ſtuft, is collected in the ſame manner as that of the Caul above-deſcribed in *chap.* 8. namely the oily part of the Bloud ſweating out of the Arteries that run in abundance between theſe Membranes, is ſtopt by them, (they being more compact and cloſe than the Coats of the Arteries) and by their reſpective coldneſs is congealed into fat. *Its Fat.*

There are almoſt innumerable Veſſels running through it, but ſuch as are rather ſuſtained and conducted by it, than for its own uſe. *Its Veſſels.*

The firſt ſort are the *Veins*, to which it gives the denomination of *Meſaraick*. Theſe are all branches of the *Porta*, and their office is to receive ſo much of the Arterial bloud as is not ſpent on the nouriſhment of the Guts and Meſentery, and to convey it to the Liver, and from thence to the Heart. Before the *milky Veins* were found out, it was believed they brought the Chyle to the Liver; but that opinion is now out of doors, as we have more fully ſhewn before in the tenth Chapter. 1. *Veins.*

Its *Arteries* alſo from its name are called *Meſaraick* or *Meſenterick*; theſe run in great numbers through it to the Guts, to which what office they perform was likewiſe declar'd above, *chap.* 10. And beſides the uſes there aſcribed to them, they continually ſupply new oily Vapours for the maintenance of the fat of the Meſentery. 2. *Arteries.*

Its *Nerves* are very numerous, and ſpring from that pair which is now (from Dr. *Willis*) commonly called the *Intercoſtal*, and reckoned for the ninth pair, but was formerly reputed the ſixth. 3. *Nerves.*

All the *venæ lacteæ* or *milky Veins* run through it from the Guts towards its centre. Theſe are very ſlender and almoſt tranſparent Veſſels, having but one ſingle Coat, and gaping with their mouths in the inmoſt Coat of the Guts do there ſuck up the Chyle, and take the neareſt courſe thence to thoſe Glands or Kernels of the Meſentery that are next to them, ſeveral ſmaller in their paſſage growing into one greater. From the ſeveral ſmaller Glands they proceed to the greateſt that is placed at the Back at the centre of the Meſentery, and from thence to the common receptacle 4. *Milky Veins.*

that

that is ſeated betwixt the Kidneys. What courſe it takes from thence the Reader may ſee in the already twice mentioned tenth Chapter.

5. Lympheducts. Beſides all theſe ſorts of Veſſels there was a fifth ſort found out by *Thomas Bartholin* (a Dane) ſome thirty years ago, which indeed are to be found in moſt parts of the Body, but moſt abound in the Meſentery, and are called *Lympheducts*, as much as to ſay, Water-paſſages. Their Coat is ſingle as that of the milky Veins, but more tranſparent; and the *lympha* or water that is contained in them, is very clear. This Liquor differs from the *ſerum* or wheyiſh watery part of the Bloud, which one may diſcover by this Experiment; If you take a little of this Liquor into a Spoon, it will ſoon thicken into a gelly of its own accord, which the *ſerum* of the Bloud will not do unleſs you heat it over the fire. It is ſuppoſed to be made of thin moiſt Vapours of the Bloud, which being condenſed into water, are imbibed by theſe Veſſels. All thoſe that run through the Meſentery diſcharge their water into the common receptacle of the Chyle above-mentioned, ſo that it paſſes together with the Chyle up the paſſage that aſcends by the Back towards the Shoulders, and there mixes with the Bloud in the ſubclavian Vein.

Its Glands. In the middle Membrane of the Meſentery (firſt found out by Doctor *Wharton* as aboveſaid) there are a great many *Glands* or *Kernels*, into which the milky Veins as they paſs through the Meſentery are inſerted, and then riſe out of them again, continuing their courſe to the one great Gland at its centre, in which they all meet together, and from it hold on their way to the common receptacle as was above-declared. By theſe Glands the ſaid Veins are ſupported and ſtrengthened in their paſſage.

Its Uſe. Now the *uſe* of the Meſentery is to be as it were a tie or band to the Guts to bind or gather them together, and to faſten them to the Back, that their great weight do not cauſe them in violent motion either to break or twiſt or roll confuſedly one over the other, whereby their gentle worm-like motion would be hindred, if not perverted or aboliſhed. And beſides by its Membranes and Glands it does guard and ſuſtain the ſeveral Veſſels whoſe way lies through it.

CHAP. XIII.

Of the Pancreas or Sweet-bread.

The Pancreas *why ſo called.* THE *Sweet-bread* is an unſhapely body, of a glandulous yet fleſh-like ſubſtance, from whence it hath its name *Pancreas* which ſignifies *all fleſh*.

Its ſituation. In diſſection it is at the end of the Liver and bottom of the Stomach; but while the Horſe is living, it is ſituated on the backſide of the bottom of the Stomach, and lies croſs the Belly lengthways as that does.

Its ſubſtance. Its proper fleſh is white and ſoft, but the little Kernels with which it is plentifully ſtored, are of a more reddiſh colour. It is covered with a ſingle Membrane which it has from the Rim of the Belly, as all the Bowels of the Lower Belly have, of which it is almoſt the leaſt.

It

It has *Veins* from that branch of the *Porta* that runs to the Spleen, and is called the Splenick. Its *Arteries* ſpring from the Cœliacal; and its *Nerves* from the Intercoſtal or ninth pair. This Bowel for its bigneſs has very many of thoſe Lympheducts that we deſcribed in the foregoing Chapter running through the Meſentery. *Its Veſſels.*

Beſides theſe Veſſels which are common to it with other parts, it has a pipe or paſſage peculiar to it ſelf, which was firſt found out at *Padua* in an humane Body about forty years ago. This paſſage is membranous, and though it be but one in its going out, yet within the Sweet-bread it is divided firſt into two, and thoſe two into innumerable ſmall branches which are diſperſed all over its Body, but their extremities terminate in the aboveſaid reddiſh Kernels with which the Sweet-bread abounds. *Its proper paſſage.*

Before this paſſage was found out, ſome thought the *uſe* of the Sweet-bread to be only to ſerve as a Cuſhion (being very ſoft) for the Stomach to bolſter upon, and to ſuſtain the Veſſels that run through it; and others, that it ſent a ferment to the Stomach to aſſiſt concoction. As to this latter uſe it muſt needs be onely imaginary, ſeeing there is no paſſage from it to the Stomach. And as to the former, though it doe thoſe offices mentioned, yet from its proper paſſage (which opens into the beginning of the ſmall Gut very near the ſame place where the Gall-paſſage enters) it gives ſuſpicion that it has a further uſe. Now ſome have been ſo curious as to open Dogs alive, and cutting off this paſſage where it is inſerted into the Gut, to receive its end into a narrow-mouth'd Veſſel, (you may ſee the manner of it in *Barthol.* Anat. *l.* 1. *c.* 13.) into which Veſſel in a few hours time there has a Spoonfull of Juice deſtilled out of it. And this Juice, to diſtinguiſh it from all other Liquors in the Body, they call the *Pancreatick juice*, from the name *Pancreas* whereby the Sweet-bread is otherwiſe called. So that it ſeems there is a peculiar Liquor ſeparated from the Arteries into this paſſage in the little Kernels or Glands above-ſpoken of, which thoſe that have taſted it, ſay, is of a ſaltiſh and ſomewhat ſowriſh taſte. Now this Juice paſſing by its Pipe into the beginning of the ſmall Gut, meets there with the Gall, with which it ferments, and cauſes ſome fermentation in the Chyle as it deſcends that way, whereby its purer parts are ſeparated from the more impure and earthy, as was diſcourſed more fully in the eleventh Chapter, when we were deſcribing the ſmall Gut, (to which the Reader may pleaſe to turn back.) *Its Uſe.* *The Pancreatick Juice.*

As for the *figure* of the Sweet-bread, you have it expreſt in the next Table but one, namely in that wherein the Spleen is alſo deſcribed.

CHAP. XIV.

Of the Liver.

HAVING now done with the Parts that miniſter to the firſt concoction, namely *Chyliſication*, we proceed to thoſe other that in ſome meaſure, ſome more ſome leſs, aſſiſt *Sanguification*, of which the *Liver* was eſteemed by the Ancients the principal, nay almoſt the onely inſtrument. Which errour of theirs was founded on this miſtake in Anatomy, That having not then found out the milky Veins which we have before deſcribed, they thought that the Chyle was received out of the Guts by the Meſaraick Veins, which being branches of the *Porta*, all run to the Liver; And the *Cava* or large hollow Vein that ariſes out of the Liver, and is the trunk whence all the branches of Veins in the whole Body ſpring, containing nothing in it but bloud, it neceſſarily follow'd that if the Chyle came to the Liver, it muſt by it be turned into bloud before it departed from it again. Yea ſo deep was this Opinion of the Liver's making bloud fixed in Mens Brains, that for ſome while after the milky Veins were found out, they would needs have *them* to convey the Chyle to the Liver, though they were forced to a thouſand ſhifts to apologize for their non-appearance between the great Gland of the Meſentery, (whither they might be eaſily traced) and the Liver. But this prejudice was ſoon overcome when about thirty years ago the common Receptacle (deſcribed before in the tenth and twelfth Chapters) was found out, and a new office was invented for the Liver, which yet may in ſome ſort be ſaid to aſſiſt Sanguification: and what this office is, ſhall be ſhewn by and by in this and the next Chapters.

Its ſubſtance, ſituation and figure.

The *ſubſtance* of it is like concrete or congealed Bloud, for which cauſe it is called *Parenchyma*, which is to ſay an affuſion or ſhedding forth of bloud. It is one in number, and ſituated in the Lower Belly in the upper part thereof on the right ſide under the ſhort Ribs, near to the *Diaphragma* or Midriff, in its upper ſide, and its lower lies upon the right and foreſide of the Stomach. It is divided into ſeveral Lobes or Flaps, in Horſes, otherwiſe than in Men, in whom it is one continued body. Theſe Lobes do cover the Stomach, graſping of it (as it were) as one ſhould graſp any thing with their hand by ſpreading their fingers about it. This covering the Stomach ſtands in great need of, for thereby is the heat thereof much cheriſhed for the furthering concoction. As for its *ſhape*, you cannot ſo well conceive it by any deſcription, as by the figure of it annexed at the end of this Chapter, which you may pleaſe to take a view of.

Its Ligaments and inveſting Membrane.

It is tied in its place by three Ligaments: the ſtrongeſt of which is that which is called its *ſuſpenſory* Ligament. This ſprings from the *Peritonæum* where it is ſpread over the under ſide of the Midriff. It is very ſtrong and membranous, and ariſing from the Midriff ſomewhat towards its right ſide, it is inſerted into the upper or bunching ſide of the Liver, into which it enters a little way; but in its entrance it loſes one of its Membranes, which dilating or ſpreading it ſelf makes the skin that enwraps

wraps the whole Liver; for the Liver is onely covered with one thin skin which it has from this Ligament. There is a *ſecond* Ligament which ſeems to ſpring from this skin of the Liver, and is inſerted into the ſharp-pointed Griſtle at the bottom of the Breaſt-bone. By theſe two is the Liver kept from falling lower down into the Belly, or from ſlipping out of its place ſideways. The *third* Ligament is not one originally, but when the Foal is in the Womb it ſupplies the place of a Vein, running from the Navel to the lower or hollow ſide of the Liver, and by it is nouriſhment brought from the Dam to the Foal. But as ſoon as it is foaled, and it begins to take its nouriſhment by the mouth onely, and not any longer at all this way, this Vein dries and cloſes up, and ſo degenerates into a Ligament, whereby the Liver is kept from aſcending or bearing up againſt the Midriff, as it might have done in an Horſes leaping or the like. This is juſt oppoſite to the *Suſpenſory* one, entring in at the lower ſide over againſt where that does on the upper.

Veins. It hath two ſorts of *Veins*. The *firſt* are the roots of the *Vena cava* or large hollow Vein, which ſpreading themſelves through all its parts, do receive into them the bloud that is brought into the Liver by the *Porta*; which having done, the ſmaller roots two or three of them grow into one, and this one uniting with two or three of the like kind into another larger root, they do at laſt all of them meet in one trunk and make the hollow Vein, which iſſuing out of the upper part of the Liver preſently enters the Midriff, and ſo aſcends up to the Heart. The *ſecond* ſort of Vein is the *Porta*, all whoſe branches coming from the Guts, Spleen, Stomach, *&c.* and uniting into one trunk enter the Liver on its lower or hollow ſide, into which it is no ſooner entred, but preſently it diſperſes it ſelf into innumerable branches through all the Lobes of the Liver, affording nouriſhment unto it, in that regard ſupplying the place of an Artery, which it reſembles the more, becauſe within the Liver it has two Coats, the outer whereof it receives from that skin that cloaths the Liver, in its entrance into it. Now ſo much of the bloud that is imported by the *Porta*, as is not ſpent on the nouriſhment of the Liver, is drunk in by the roots of the *hollow Vein* before-mentioned, and returned to the Heart. This Vein is called *Porta* or *Vena portæ*, the Gate-vein, from two bunchings out, of the Liver, (called *gates* by *Hippocrates*) between which it enters it.

Arteries. Yet is not the Liver, at leaſt all the parts of it, onely nouriſhed by the bloud that is brought in by the *Porta*; for there is a branch which comes from the Cœliack Artery that aſcends to its hollow ſide juſt by the *Porta*, which ſends forth twigs all over its Coat, as likewiſe through the Coats of the *Porta* and the Choler-Veſſels: but whether any of them enter into its parenchyma or ſubſtance, is not diſcovered. Theſe twigs of Arteries bring vital heat and nouriſhment to thoſe parts through which they run.

Nerves. Its *Nerves* ſpring from the Intercoſtal pair, *viz.* partly from the ſtomachick and partly from the meſenterick branch thereof. Theſe onely are communicated to thoſe parts to which the Arteries are diſperſed, ſo that the ſubſtance of the Liver has very little ſenſe.

Lymphedu&s. We ſhew'd before how that for ſome while after the milky Veins were found out, they were believ'd to convey the Chyle to the Liver: and all the colour for this Opinion was a few ſmall clear, limpid and almoſt tranſparent Veſſels, that run between the Meſentery and it. But as on

the one hand they are too few in number for that office (eſpecially being ſo ſlender) being ſcarce one for ten of the milky Veins in the Meſentery: ſo on the other, they are neither of the ſame colour (as being much clearer) nor does the Liquor they contain come from the Meſentery to the Liver, but runs from this to that, as has been obſerved in Live-diſſections, in which having been tied they have ſwelled on that ſide of the Ligature toward the Liver, and grown empty toward the Meſentery. They are indeed then truly *Lympheducts*, which carry that water that is ſeparated from the bloud in the Liver, towards the Meſentery, and from it to the common receptacle of the Chyle with which it mixes.

Beſides theſe Veſſels there are the numerous branches of the Gall-paſſage, of which we ſhall treat more fully in the next Chapter. And ſhall ſay no more here, but onely how one may diſtinguiſh betwixt the branches of the *Cava*, *Porta* and theſe of the Gall-paſſage, ſo as to know which are which. Thoſe of the *Cava* are clad but with one Coat, are white, thin and of a large cavity. Thoſe of the *Porta* have a double Coat, and ſo are thicker and ſtronger, and yet not ſo wide as thoſe of the *Cava*. Laſtly, the branches of the Gall-paſſage are of a duskiſh yellow, have a thicker Coat than either the *Cava* or *Porta*, and yet have the narroweſt channel. Theſe are included in a common caſe with thoſe of the *Porta*, which makes their outer Coat.

Its Uſe. Having in the beginning of this Chapter detected the errour of the Ancients in aſcribing Sanguification to the Liver in ſo eminent and large a ſenſe; we muſt however confeſs that it does ſomething towards the purifying of the Bloud, and that is, by ſeparating the Choler from it, as ſhall be fullier ſhewn in the next Chapter. In it alſo is a pretty quantity of ſerous or wheyiſh humour filtrated or ſtrained from the Bloud, which is ſent by the Lympheducts to the common receptacle of the Chyle as aforeſaid. In the third and laſt place it furthers the concoction of the Stomach by its kind and cheriſhing heat.

The *Sixth* Table ſheweth the Liver intire, and alſo its Veſſels freed from the *Parenchyma*.

Fig. I. Expreſſes the Liver taken out of the Body, and placed with its hollow ſide uppermoſt.

AAAA *The hollow ſide of the Liver cloathed with its Coat.*
B *The* Vena portæ *or Gate-vein, and its egreſs out of the hollow ſide of the Liver.*
C *The Trunk of* Vena cava *or hollow Vein alſo coming out of the Liver.*
D *The Gall or Choler-paſſage cut off cloſe to the Liver.*
E *An Artery which is branched to the Liver from the* ramus Cœliacus.
F *A Nerve of the ſixth pair (as commonly reckoned) alſo branching to the Liver.*
GG *The Edges of the Liver turned down and hanging over the hollow ſide of it.*
HHHH *The four Lobes or Scollops of the Liver.*

Figure II.

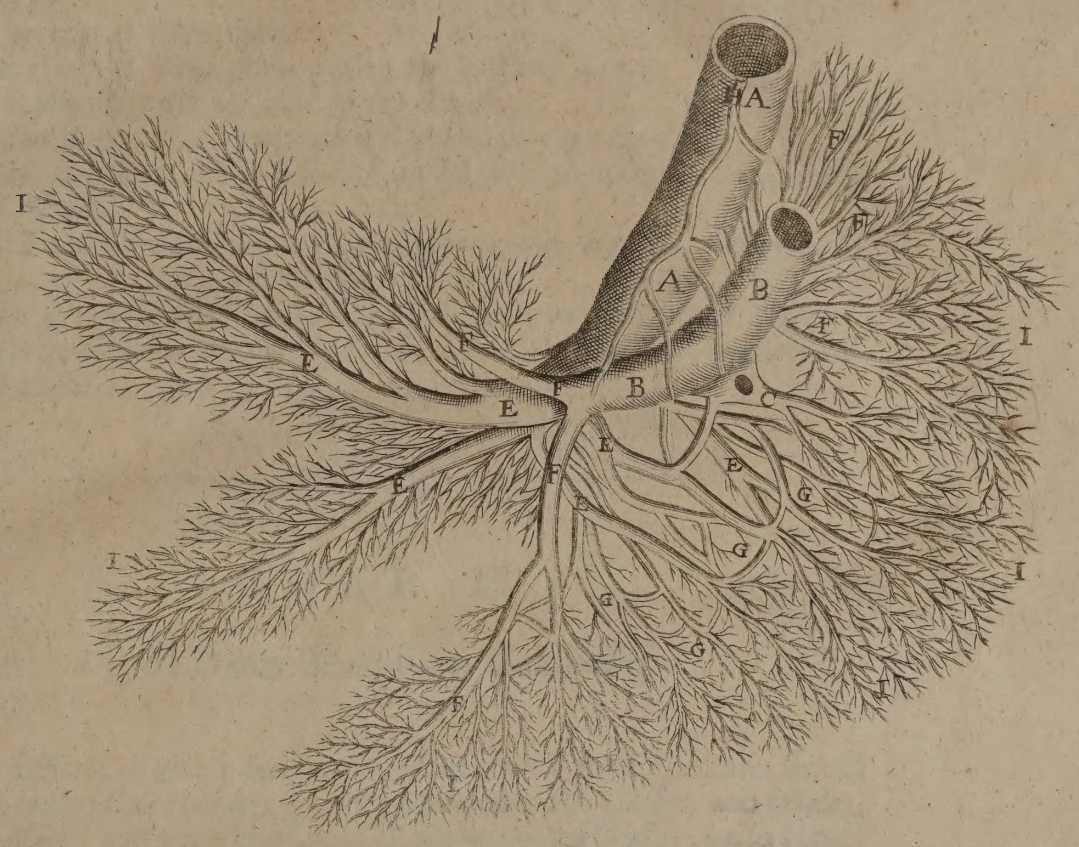


Figure. I.

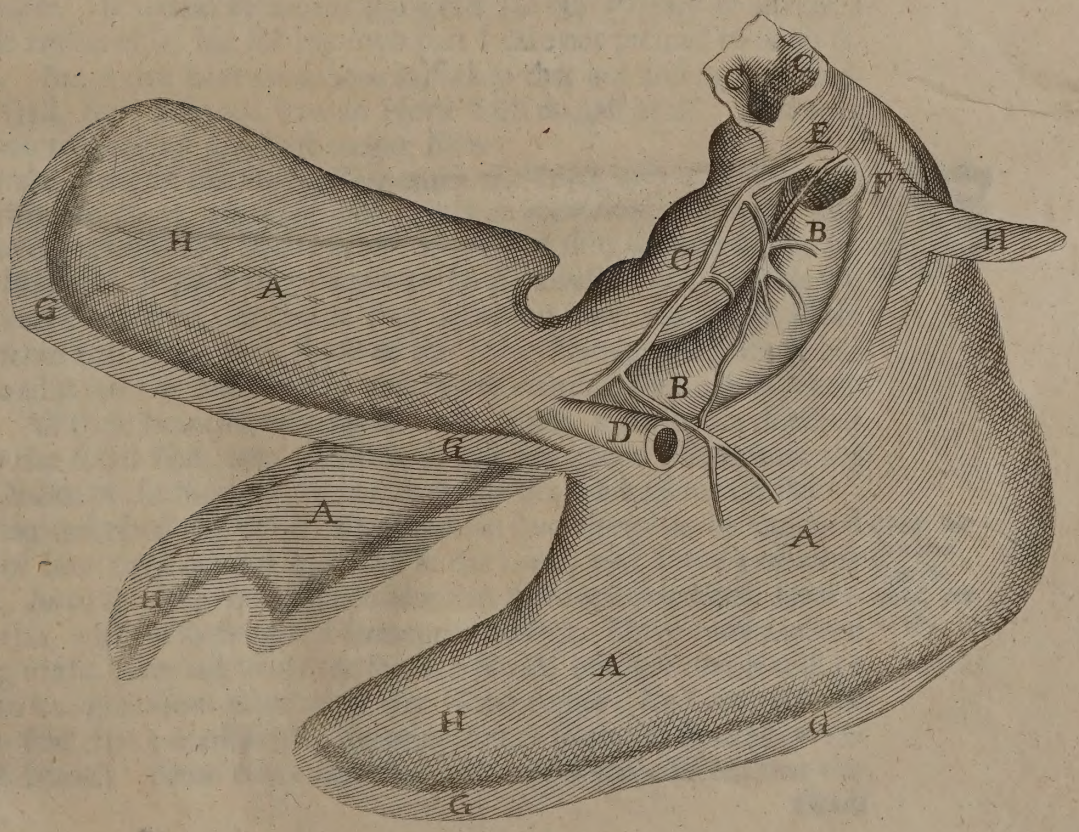


Fig. II. Repreſents the Veſſels of the Liver freed from the *Parenchyma*, or fleſhy ſubſtance thereof.

AA *A portion of* Vena cava.
BB *The Trunk of* Vena portæ *paſſing forth of the Liver.*
C *The Gall-paſſage cut off cloſe by the Liver.*
EEEE *The Branches of* Vena portæ *diſperſed through the Liver.*
FFFF *The Branches of the hollow Vein likewiſe diſtributed through the Liver.*
GGGG *The moſt remarkable Anaſtomoſes or joinings together of the mouths of the* Cava *and* Porta.
HH *The Artery that is branched to the Liver from the Cœliack Artery.*
I *The Extremities or ends of the Veins, which for their ſmallneſs are called Capillary, or hair-like.*

CHAP. XV.

Of the Porus Bilarius, *or Gall-paſſage.*

IT is difficult to give a ſatisfactory account why moſt Creatures ſhould have both a *Gall bladder*, for the collection of the Choler, and beſides, a *Gall-paſſage*; and yet a Horſe and all whole-hooſed Beaſts, as alſo Harts, Fallow-deer and ſome few others, ſhould onely have the *paſſage* without the *Bladder*. It would be worth the while for our *Virtuoſi* to invent a probable reaſon of it, but for my own part I dare not pretend to be ſo ſagacious. But much have thoſe been miſtaken that not finding any Bladder of Gall, have affirmed that an Horſe hath no gall at all. And this, Dr. *Brown* reckons up amongſt *vulgar Errors*.

Its branching in the Liver, and its tendency without it.

Now the trunk of this *Gall paſſage* enters the Liver very near the ſame place with the *Porta*, together with which it is enwrapped in one common Cover, which they both borrow from that skin wherewith the Liver is cloathed. I mean they begin to be ſo inveſted juſt at their entrance into the Liver, for before they have but each one ſingle Coat. Its branches run along with thoſe of the *Porta* through all parts of the Liver, and it has the ſame Artery and Nerve running through its Membrane. All theſe branches uniting into one trunk, it paſſes the directeſt way to the ſmall Gut, into which it is inſerted about a foot from the lower Orifice of the Stomach, where it diſcharges it ſelf of the Choler.

Choler how ſeparated from the Bloud, and its uſe.

Having deſcribed the Veſſel, there remain two things to be enquired into, *firſt* how the Choler is ſeparated in the Liver, and *ſecondly* of what uſe it is. As to the firſt, we muſt conſider that there can be no ſuch ſeparation as this, without ſome ſort of ferment to cauſe it. There comes indeed nothing to the Liver but under the form of bloud, but however it will be of uſe to examine from what parts that bloud comes: And amongſt the reſt we find that a conſiderable quantity comes from the Spleen by the ſplenick branch. Now every one that will taſte it may diſcern that the bloud

bloud that comes out of the Spleen by this branch has a kind of a ſowriſh harſh taſte to what the reſt of the maſs of bloud has. This then mixing with the reſt of the bloud and paſſing with it through the narrow Veſſels in the Liver, cauſes it there to ferment (as a ſmall piece of ſowr Dough will I know not how much that is not leavened) and in that fermentation this yellow Choler is ſeparated from the Bloud, much in the ſame manner as Yeſt from Beer in a Barrel, (which it partly reſembles in colour.) And this fermentation is aſſiſted by the proper nature and faculty of the Liver given by Nature to it; who hath alſo framed this liquor of Particles ſo differing from thoſe of the Bloud, that though the Bloud paſs out of the *Porta* into the *Cava*, yet the Choler ſtays behind and is received by the ſmall mouths of the Choler-paſſage. Some affirm this ſeparation is performed by the help of ſome Glands or little Kernels into which the ends of the ſeveral Veſſels are inſerted, but I have not been able to diſcern them. The uſe of the Gall is, Together with the Juice that is ſent from the Sweet-bread, to make a ferment in the firſt Gut for the uſes that are fully enough delivered in the eleventh Chapter: to which we ſhall onely add, that it ſerves by its acrimony to exſtimulate the Guts to expell the Excrements contained in them. And ſeeing there is no bag or repoſitory to ſtore it up in, it paſſes continually to the Guts, whereby Horſes come to dung oftener than moſt other Creatures: which as Dr. *Brown* notes, "was pru-"dently contrived by Providence in this Animal, conſidering his plen-"tifull feeding, the largeneſs of his Guts, and their various circumvolu-"tion. For, ſays he, Choler is the natural Glyſter, or one excretion "whereby Nature excludes another, *&c.*

CHAP. XVI.

Of the Spleen or Milt.

The ſubſtance of the Spleen. THE *Spleen* or *Milt* is of a ſoft, ſpongious *ſubſtance*, like thick, black and congealed Bloud, from which it is ſaid to be generated; though ſome that of late have examined it more curiouſly with Magnifying Glaſſes, declare the greateſt part of its ſubſtance, beſides the Bloud-veſſels, to conſiſt of abundance of little Kernels incloſed in skinny Cells like Honey-combs, which in their own nature are of a white colour, and will appear ſuch when the Bloud is waſht from them. For my own part, I queſtion whether there be any ſuch Kernels in it, or if there be, they muſt be far different from thoſe of any other part, and be of a much looſer ſubſtance, ſeeing I have onely in River-water (after I had taken off the inveſting skin) waſht off the parenchyma ſo clearly from the Veſſels, that there has ſeem'd to be nothing elſe remaining. A figure of which Veſſels ſo cleared of the parenchyma by waſhing, you have in the following Table.

Its ſituation and connexion. Its *ſituation* is under the ſhort Ribs on the left ſide over againſt the Liver, between the Stomach and the ſhort or baſtard Ribs. It *cleaveth* oft-times to the Midriff by a skin or coat, which it hath from the Rim of the Belly. It is alſo faſtned by a skin to the Stomach.

It is

It is of a triangular *ſhape*, yet long, and ſomething ſharp-pointed, as you may ſee in the Figure. *Its Figure.*

Its *Colour* is (in a ſound Horſe) reddiſh, inclining ſomewhat to black; but in an unſound Horſe it is more inclining to black, or of a leaden or aſhey colour: yet moſt times in an unſound Horſe it is of the colour of the Humour which offends. *Its Colour.*

There are ſeveral Creatures that naturally have no Spleen, as all Inſects; and therefore that Proverb is not literally true, *That even a Fly has a Spleen*; Such alſo as have no Piſs-bladder, want the Milt, as the *Chameleon*, and many ſuch like: But now it is a great queſtion, whether ſuch Creatures as by Nature have Spleens, can have them taken out, and yet live. It is true indeed that other Parts that ſeem to be as conſiderable, have been taken even out of *Humane* Bodies, and yet the Parties have lived: So I have read of ſome Women that upon incurable diſtempers in the Part, have had their Womb cut out, and yet have liv'd in tolerable health afterwards (*Barthol.* Epiſt.) And it is a common thing to geld any ſort of Creature, though there be conſiderably large Veſſels that run to the Stones. But it is to be confeſs'd that theſe parts inſtanc'd in, ſeem to be wholly framed for the propagation of the ſeveral *kinds* of living Creatures, and not for the neceſſary ſervice of the *Individual* that has them. And therefore when they are taken away, though the end for which they were created, to wit *generation*, be fruſtrated by the loſs of them; yet may the Creature it ſelf that loſes them, live well enough without them. But now as for the Spleen, it does not at all ſerve for procreation, but is of uſe onely to that Body that has it. (What its *uſe* is, we ſhall ſhew towards the latter end of this Chapter.) Yet ſeveral have boaſted that they have taken it out of Dogs and Cats, and that they have lived in pretty good plight a conſiderable while after. The operation muſt needs be ſomewhat difficult, ſeeing the Spleen is ſeated on the inſide of the ſhort Ribs, nearer the Back than the Breaſt: nor can I believe that a Horſe could live any while if it were taken out of him; but leaſt of all could Man, in whom it is larger than in any other Creature, as *Bartholin* affirms. For the Veſſels that are inſerted into it are ſo many and large, that it would ſeem impoſſible to ſtanch the Bloud; beſides the neceſſary uſe that it ſeems to be of to the Body, of which by and by. *Whether an Horſe can live without it.*

The *skin* that it is covered with, is *thicker* than that of the Liver, both becauſe of the looſe and ſoft ſubſtance of the Spleen that required a ſtronger covering to defend it; and alſo that it might the better ſuſtain the ſtrong beatings of its Arteries that are pretty large and many. This skin it has from the *Peritonæum* or Rim of the Belly, to which it is commonly knit, as alſo to the left Kidney and the Midriff, and on its inſide to the Caul. Some late Anatomiſts have affirmed it to be clad with two Coats, the outer that which we have mentioned, and the inner ariſing from the Veſſels that enter the Spleen. *Its Membrane.*

All the *Veins* that it has, are from that branch of the *Porta* that is called the Splenick branch. For the *Porta* as ſoon as it comes out of the lower or hollow ſide of the Liver, ſends one notable Branch to the Spleen, which paſſing croſs the Body from the right to the left ſide under the Liver and Stomach, enters the Spleen and diſperſes it ſelf into innumerable Twigs all over it. A Twig of the ſplenick Artery opens into this Vein a little before it enters the Spleen: And from the lower end of the Spleen there *Veſſels. 1. Veins.*

there go two or three Veſſels to the Stomach, which are called *Vaſa brevia* or ſhort Veſſels. The uſe of the ſplenick Vein is to bring from the Spleen all that arterial blood that is not ſpent on its nouriſhment; and beſides, that proper and peculiar juice that is made in the Spleen, of which preſently.

2. *Arteries.* Its *Arteries* are three or four times more in number than the Veins, and all of them ſpring from the left Cœliack branch that has the name of *Splenick*, from the Spleen, into which it is inſerted. Hereby it receives vital heat and nouriſhment, and matter out of which to make its proper juice. Before this Artery enter the Spleen, it ſends forth one twig that unites with and opens into the ſplenick Vein, as was noted before.

3. *Nerves.* Its *Nerves* are but ſmall yet pretty numerous. They ſpring from a meſenterick branch of the left Intercoſtal Nerve, and are diſperſed principally through the skin that covers it, though ſome few enter its ſubſtance.

4. *Lympheducts.* Laſtly, it has ſeveral *Lympheducts*, or Water-paſſages, which creeping all over its Coat, take their way along the Caul towards the common receptacle of the Chyle, into which they empty the liquor contained in them, as all thoſe that ariſe from the ſeveral parts of the lower Belly do. What theſe Lympheducts are, and what that liquor is which they contain, I have ſhown above in the 12th Chapter, *of the Meſentery*.

Its action and uſe. There is no part of the Body concerning whoſe uſe there has been greater diverſity of opinion. *Some* have made it the receptacle of black Choler (or of thick dreggy Bloud) ſeparated in the Liver and brought hither by the ſplenick branch. *Others* that thought this too ignoble and baſe an uſe for ſo conſiderable a part, eſteem'd it to be as it were a ſecond Liver: For as they believed that the thinner and more ſpirituous part of the Chyle paſſed to the Liver; ſo, that a thicker and more dreggy part went to the Spleen, of which was made a blacker and more earthy ſort of Bloud, partly for its own nouriſhment, and partly for the nouriſhment of the Stomach, Guts, Meſentery, *&c.* In anſwer to theſe two opinions it will be ſufficient to ſay, That the firſt is contrary to the circulation of the Bloud, nothing paſſing from the Liver to the Spleen, but contrarily from the Spleen to the Liver: and the latter, beſides that it is contrary to the ſaid circulation, is repugnant alſo to the true motion of the Chyle, none of which either paſſes to the Liver or Spleen, as we have more than once ſhown already. A *third* opinion is, That of the bloud that the Arteries bring to it in great plenty, is made a certain acid or ſowr Juice, which is ſent by the *vaſa brevia* or ſhort Veins to the Stomach, into which being diſcharged, it partly provokes appetite, and partly helps concoction: And this Opinion has had a great many Abettors, whereas its falſity may be demonſtrated by this, that if one open a Dog (or the like) alive, and tie theſe ſhort Veins with a thred, they will fill and ſwell betwixt the Stomach and Ligature, but will grow empty on that ſide toward the Spleen; which is a plain evidence that the Bloud or whatever other Humour that runs in theſe ſhort Veins, flows *from* the Stomach and not *to* it. However we will grant that the Spleen does indeed make ſuch a ſowr Juice, of part of the Arterial bloud that is imported into it by the ſplenick Artery; but then it paſſes not from thence to the Stomach, but to the Liver by the ſplenick branch of the *Porta*: for if one tie the ſaid branch, as was ſaid above of the *ſhort veins*, it will fill towards the Spleen and grow empty towards the Liver. And the uſe of this Juice ſeems to

be

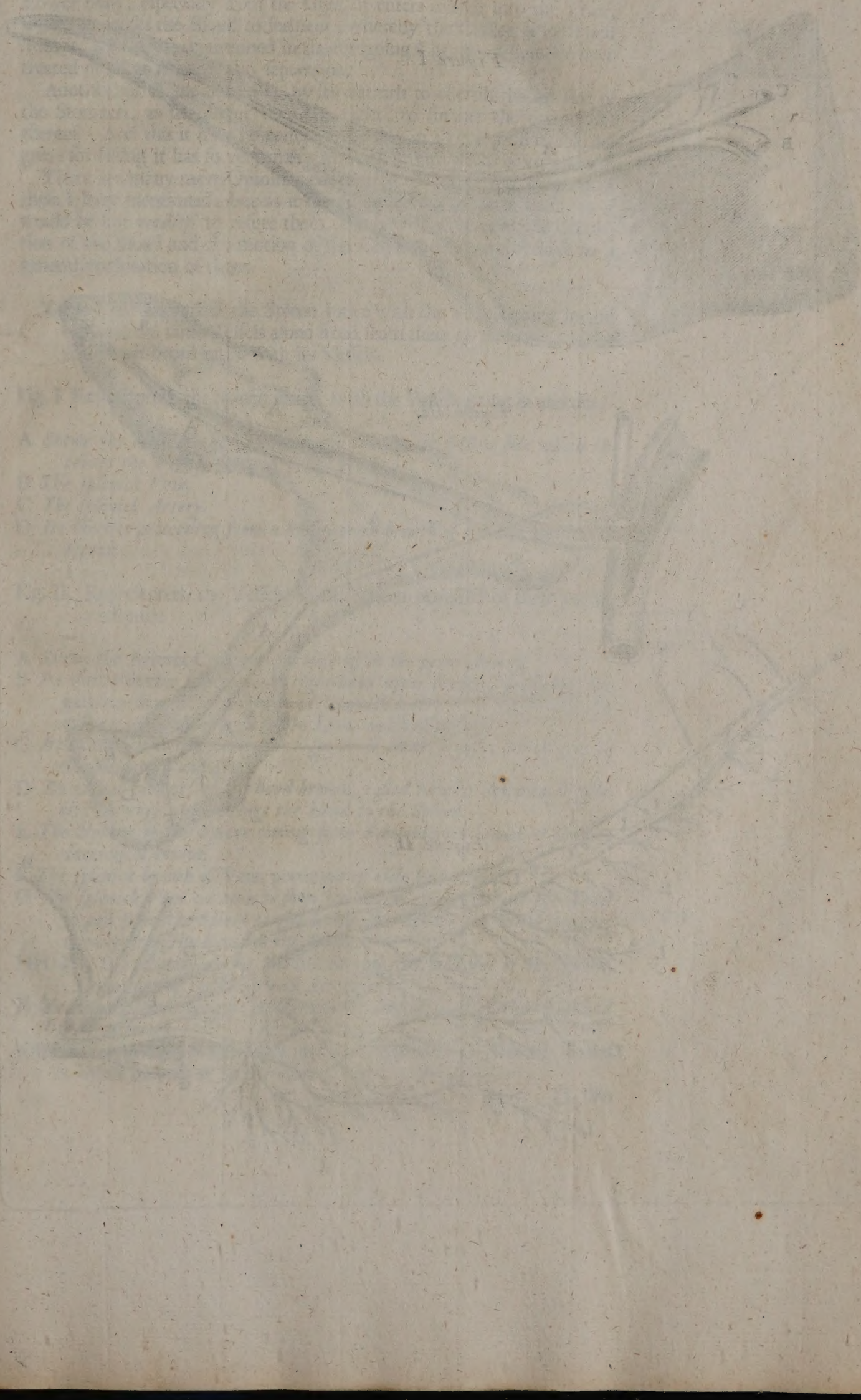


Figure I.

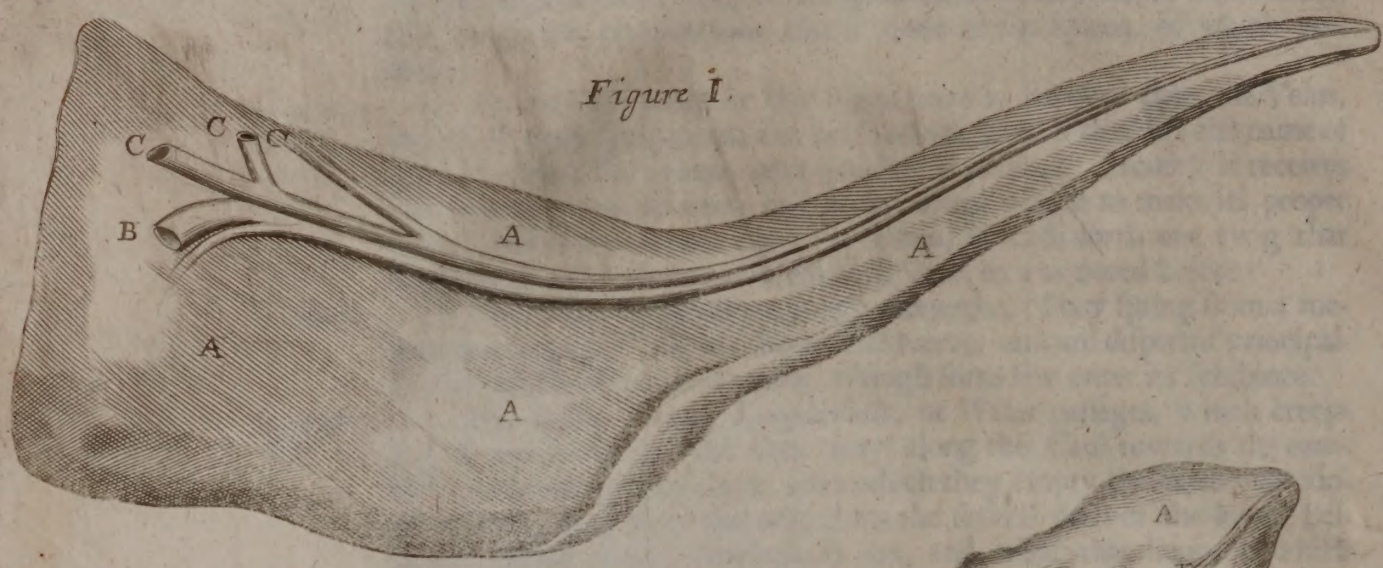


Figure. III.

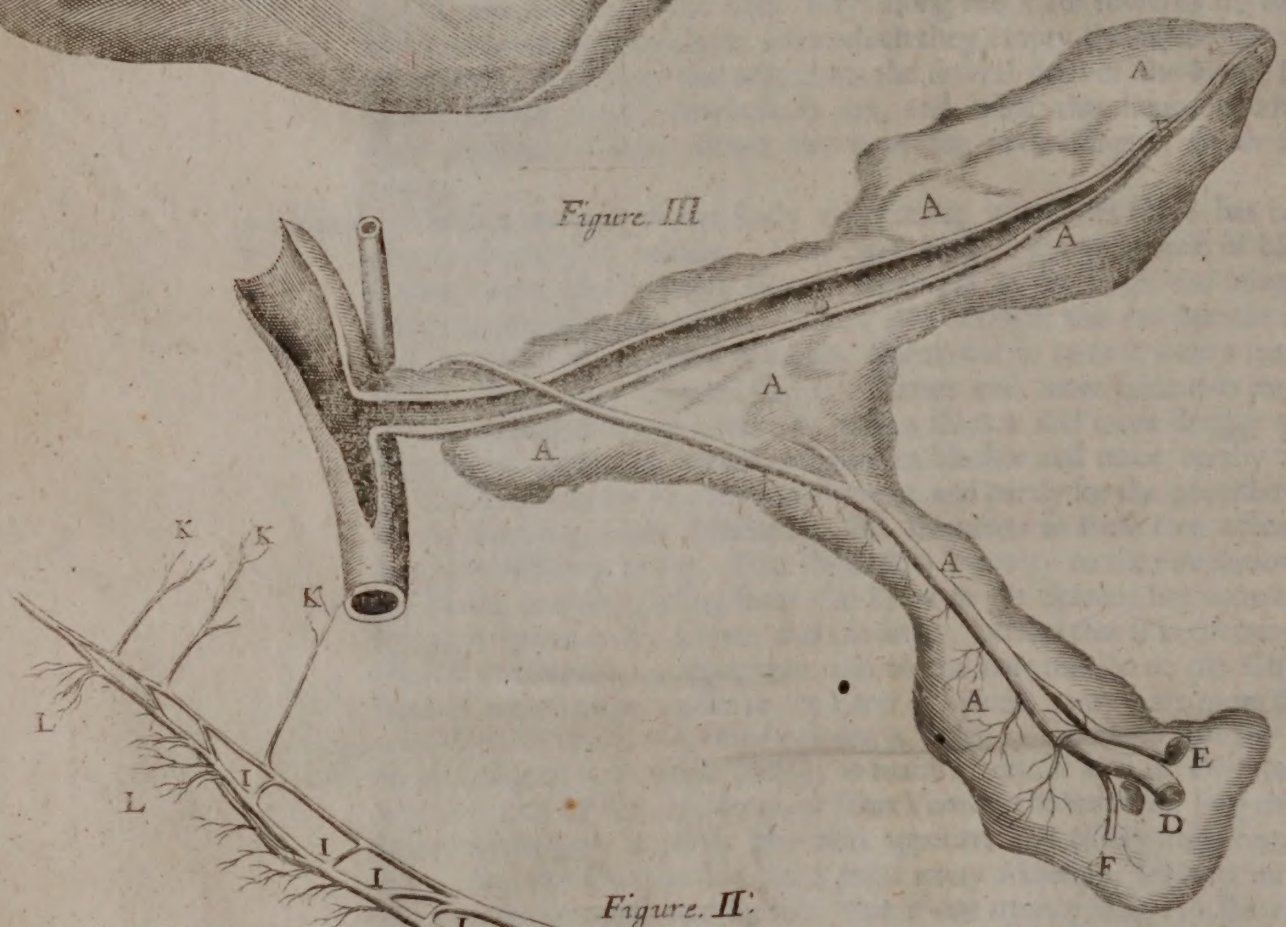
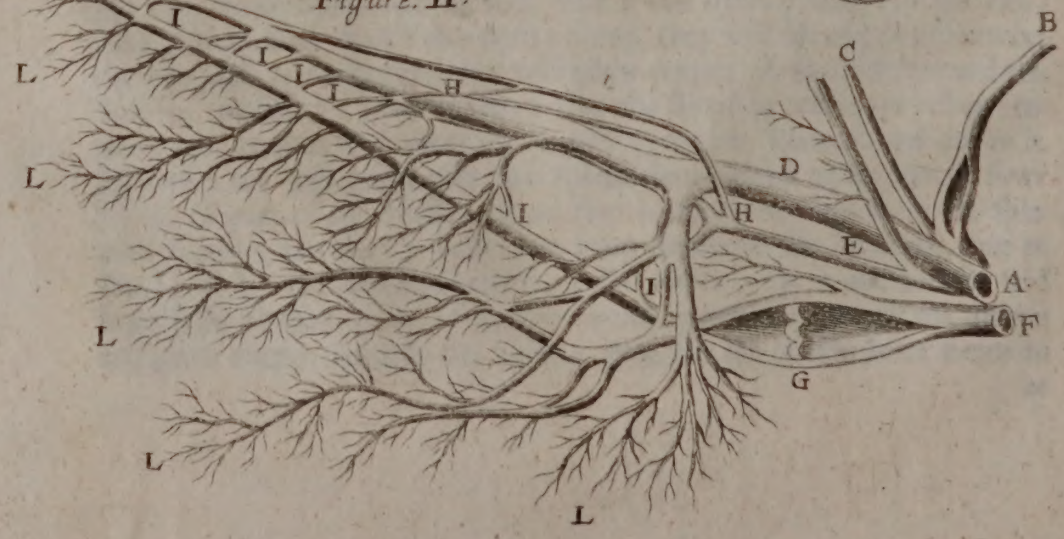


Figure. II.



be this, *viz.* That mixing in the trunk of the *Porta* with all the Bloud that is received by the branches thereof out of the ſeveral parts of the Lower Belly, eſpecially from the Guts, it enters with it into the Liver, where it cauſes the Bloud to ferment, whereby the Choler is ſeparated from it, for the uſes mentioned in the foregoing Chapter, where we have treated more at large of this ſeparation.

Another *uſe* of the Spleen is, by its warmth to cheriſh the left ſide of the Stomach, as the Liver does the right, to further the concoction thereof. And this it may be conceived to doe in a very conſiderable degree; for ſeeing it has ſo very many Arteries, it muſt needs be very warm.

There are many more Opinions concerning the uſe of the Spleen than theſe I have mentioned: but as it would be *tedious* to recite them, ſo it would be but *needleſs* to refute them, the new Doctrines of the circulation of the Bloud and the motion of the Chyle being improveable to a general confutation of them.

Table VII. Expreſſeth the Spleen intire with the Veſſels going in and out, and the ſame Veſſels alone freed from their *parenchyma*; as alſo the Sweet-bread intire with its Veſſels.

Fig. I Repreſenteth the Spleen intire, with the Veſſels going in and out.

A *Shews the body of the Spleen on the concave or hollow ſide which receives the Veſſels.*
B *The ſplenick Vein.*
C *The ſplenick Artery.*
D *Its Nerves proceeding from a Meſenterick branch of the left Intercoſtal Nerve.*

Fig. II. Repreſenteth the Veſſels of the Spleen deveſted of their parenchyma.

A *Shews the* Arteria Cœliaca, *cut cloſe off at the great Artery.*
B *Its* ramus dexter ſuperior, *or right-hand upper branch, producing the* gaſtrica dextra, *or right-hand Stomach-artery: it makes alſo the* cyſticæ gemellæ *that go to the Liver and Gall-paſſage.*
C *Its* ramus dexter inferior, *or right-hand lower branch, which goes to the Meſentery and Guts.*
D *Its* ramus ſiniſter, *or left-hand branch, called* Arteria Splenica *or ſplenick Artery, which brings the bloud to the Spleen.*
E *The Nerves of the Spleen coming from a meſenterick branch of the left Intercoſtal Nerve.*
F *The ſplenick branch of* Vena portæ *cut off cloſe by its trunk.*
G *The ſplenick Vein cut open to ſhew its Valves, which permit the Bloud to paſs from the Spleen to the Liver, but hinder any Bloud from returning from the Liver to the Spleen.*
HH *The Diſtribution of the Nerves through the ſubſtance of the Spleen, accompanying the Veins and Arteries.*
II &c. *Several (ſeeming) Anaſtomoſes or inoſculations of the Veins and Arteries.*
KKK *Veſſels going from the lower end of the Spleen to the Stomach, called* Vaſa brevia, *or ſhort Veſſels.*

LL *&c. The capillary branches of Veins, Arteries and Nerves diſperſed through the whole ſubſtance of the Spleen.*

Fig. III. Repreſenteth the *Pancreas* or Sweet-bread freed from its Membrane and part of its ſubſtance, the better to ſhew the courſe of the Veſſels in it, which come to it from the ſplenick Vein and Artery. It repreſenteth alſo the new *Wirtſungian* paſſage, ſo called from the late Inventer of it.

A *Shews the body of the* Pancreas *diſſected.*
B *The new paſſage called* ductus Wirtſungianus *or* pancreaticus.
C *The Orifice of the ſaid paſſage where it opens into the beginning of the ſmall Gut.*
D *The Artery of the Sweet-bread diſperſed through its ſubſtance.*
E *The Vein of the Sweet-bread diſperſed likewiſe through its ſubſtance.*
F *Its Nerves, being a branch of the Intercoſtal pair.*

CHAP. XVII.

Of the Kidneys, and Deputy-kidneys.

Their name. THE *Kidneys* are otherwiſe called *Reins* from their Latine name *Renes*, which is derived from a Greek word which ſignifieth *to flow*, becauſe the watery or wheyiſh part of the Bloud doth continually flow through them, and maketh the Urine.

Number, ſituation and connexion. They are in *number* two, that when one is ſtopt with a ſtone or gravel, or hurt by any accident, the Urine might be ſeparated in the other, or otherwiſe the Beaſt would die. They are *ſeated* in the Loins behind the Stomach and Guts, the right under the Liver and the left under the Spleen, on each ſide of the hollow Vein and great Artery, oppoſite to one another. They reſt upon the Muſcles of the Loins, and are included betwixt the Membranes of the *Peritonæum* which keeps them firm in their place. They are *knit* to the hollow Vein and great Artery by the Emulgent Veſſels, and to the Bladder by the Ureters which we ſhall deſcribe in the next Chapter.

Figure. They are ſeldom like to one another in *ſhape*; for the Right is in figure like a Heart, but ſomething flatter; whereas the left is like that of a Man, *viz.* of the ſhape of a Kidney-bean, as you may ſee them repreſented in the following Figure.

Membranes. They are covered with two *Membranes*, an *inner* which is *proper*, and an *outer* which is *common*. The *inner* Skin ſeems to ſpring from the outer Coat of thoſe Veſſels that enter into them: this cleaves ſo cloſe to them, that it can hardly be ſeparated, being very thin, and having ſmall threds of Nerves running along it from a twig of the Intercoſtal Nerve. The *outer* which is common, is borrowed from the Rim of the Belly, and is wrapped ſomewhat looſely about the Kidney. This Skin is bedaubed with fat, and is therefore called the *fatty Coat*; and into it are inſerted an Artery

tery and Vein, which have alſo the title of *fatty*, and ſpring from the great Artery and hollow Vein.

As to their *ſubſtance*, it has been always till of late held to be hard and compact fleſh; and indeed it handles pretty firm to the touch, and ſeems to be fleſhy to the bare eye. But ſeeing there is no ſeparation made of any thing from the Bloud in other Parts, but by the help of Glands or Kernels; (for ſo is the Slaver ſeparated in the Mouth, the Choler in the Liver, bad Humours in the Guts upon taking a purge, *&c.*) I ſay, for that cauſe it is reaſonable to give credit to thoſe curious Anatomiſts that by their Magnifying Glaſſes or Microſcopes have diſcovered the ſubſtance of the Kidneys to be for the greateſt part made up of ſuch Glands, by means of which the Urine is ſeparated from the Bloud, in ſuch manner as we ſhall ſhew by and by. *Subſtance.*

Their *Arteries* and *Veins* are called *Emulgents*, becauſe they do as it were *milk out* the Urine from the maſs of Bloud. Each Kidney has for the moſt part but one Artery and one Vein; yet ſometimes two or more of a ſort. But whether the Trunk be one or more, each as it enters the Kidneys is branched into ſeveral, and thoſe into more ſucceſſively, till they become as ſmall as hairs. The Emulgent *Arteries* ſpring from the Trunk of the great Artery, and the *Veins* from the hollow Vein: Both theſe as they enter the Kidney, are deveſted of their outer Coat, which makes the proper Coat of the Kidneys, as was obſerved above: but inſtead of that loſs they are inveſted in one common Caſe with the branches of the Ureter, even as we ſhewed in the fifteenth Chapter that the branches of the Gall-paſſage in the Liver are included in one common Coat or Caſe with thoſe of the *Porta*. The Arteries bring bloud for their nouriſhment, and moreover the watery humour that is ſeparated in them and makes the Urine. By the Veins the bloud circulates back again to the hollow Vein or *Cava*, and by it aſcends up to the Heart. *Veſſels, viz. Emulgent Arteries, and Veins.*

Beſides the innumerable little Kernels which we have ſhewn the ſubſtance of the Kidney to conſiſt of, there are about ten of a more conſiderable bigneſs in the middle or centre of it, placed at the entrance into the *pelvis* or Baſon, which are in Latin called *Carunculæ Papillares*, in Engliſh Papillary Caruncles, and by ſome they are called Teat-like Productions, both which names they have from the likeneſs they have to the Teats or Nipples of Women. They are ſomething harder than the reſt of the ſubſtance of the Kidney, and alſo of a fainter colour. They are in bigneſs as large as a ſmall Horſe-bean. They have each ſeveral ſmall holes or pores, through which the Urine deſtills out of the ſlender Urinary Pipes in the body of the Kidneys, into the cavity of the *pelvis*. *The Papillary Caruncles.*

Now this *pelvis* or Baſon is a membranous cell or cavity in the middle of the Kidney, and is nothing elſe but the head of the *Ureter* widened. There run out of it ſeveral large pipes to the aforeſaid Teat-like Kernels, (one pipe to each Kernel) by which the Urine drils into this cavity, and out of it into the *Ureter*. *The pelvis or Baſon.*

The *action* of the Kidneys, is to ſeparate the wheyiſh Humour from the Bloud, which they do in this manner and order. We find that an Horſe can no more live without drink than meat: Now the drink ſerves not onely to cool the Body, but much more is it of uſe to make the Chyle thin, that it may be able to paſs through the narrow ways of the milky Veins; ſo that the water which the Horſe drinks, paſſes along with the more oily Chyle into the maſs of Bloud, whither having con- *Their Action.*

ducted it, the water is now of no more uſe, and therefore the Emulgent Arteries above-deſcribed conveigh it to the Kidneys together with the Bloud, to caſt it out: But the Bloud, being of a thicker body than the water, cannot enter through thoſe narrow paſſages which the other deſtils through, and therefore what is more than ſerves for their nouriſhment, returns back from the Kidneys by the Emulgent Veins into the *Cava*, and ſo returns to the Heart again in its circulation. But the watery or wheyiſh part running out of the larger into the ſmaller branches of the Emulgent Arteries ſucceſſively, and the ſaid branches ſo often dividing themſelves till at laſt they become as ſmall as an hair and end in the little Kernels towards the outſide of the Kidneys, this watery Humour is milked as it were through theſe Kernels into ſmall urinary pipes, as ſlender almoſt as Fibres, by which it drills along to the Papillary Caruncles, and is again ſtrained through them into the Baſon, from whence it glides down the Ureters into the Bladder, where when it becomes troubleſome either by its quantity or ſharpneſs, &c. it provokes the Horſe to ſtale, and is called Urine. But ſeeing the Piſs is not of the ſame colour with the water that was drunk, but generally a great deal yellower, it is likely it gains that colour from a little quantity of Choler mixed with it: And as the Choler *either* retains it natural colour, to wit yellow, *or* is preternaturally of ſome other, as black, greeniſh, &c. the Urine will be tinctured accordingly; as any Man may obſerve in Horſes that are diſtempered. So that in Horſes as well as in Men, one may many times gain ſome knowledge of the Diſtemper from the Urine.

Deputy-kidneys, their name, ſituation, bigneſs and ſhape.

Over the Kidneys a little more outward, and about an inch from them, there ſtand two Kernels, which are known by ſeveral *Names*, from the ſeveral uſes that Authors have aſcribed to them. Some call them Deputy-kidneys, becauſe of ſome reſemblance they have to the true ones in their frame, and becauſe they have been thought to aſſiſt them in ſeparating the Urine. *Bartholine* calls them Black-choler Caſes, from an Opinion that they receive black Choler from the Spleen. Others have impos'd other Names on them, which we ſhall not recite. It is not long ſince they were firſt found out. They are in an Horſe about as *big* as a Garden-bean, and of that *ſhape* as they are repreſented in the Figure. They are covered with a ſingle thin skin, which commonly ſticks to the fatty skin that inveſts the Kidneys. They have a ſmall cavity in them.

Their Veſſels. Their *Veins* and *Arteries* generally come from the *Emulgents*, but ſometimes immediately from the great Artery and hollow Vein. The Arteries bring them bloud for nouriſhment, from which what remains, returns back by the Veins, as alſo does that Humour whatever it be that is concocted and ſeparated in them, for there is no other veſſel to do it. They have indeed ſome *Lymphducts*, but thoſe are common to *them* with *other* parts, and have no peculiar uſe here. Their *Nerves* ſpring from that branch of the Intercoſtal pair that goes to the Stomach, to the Spleen, and to the inner or proper skin that cloaths the Kidneys.

Their Uſe. In their Cavity there is commonly found a blackiſh Humour, which is made of part of the Arterial bloud that flows to them; but of what nature or uſe this Humour ſhould be, is very uncertain. It has no way to go out of the Cavity but by the Veins, which depoſite what is contained in them into the Emulgent Veins, or into the *Cava*, and ſo it muſt needs paſs with the Venal bloud to the Heart. If there could be found

found out any way whereby it could probably paſs to the Kidneys, then *Bartholine*'s Opinion, that they make a ferment for the uſe of the Reins, for the better ſeparating of the wheyiſh Humour from the Bloud, were very plauſible; but till then, one muſt ſuſpend their belief of it. As for mine own part, ſeeing ſo many learned Anatomiſts as have treated of them, are at a loſs in diſcovering their true uſe, I will not be aſhamed to confeſs my own ignorance and unſatisfiedneſs therein alſo.

CHAP. XVIII.

Of the Ureters or Paſſages of Urine.

THE *Ureters* or Urine-pipes or Chanels are in number two, ſeated on each ſide of the hollow Vein and great Artery, at ſome diſtance from them. Their head or beginning is the Baſon of the Kidneys, at whoſe hollow ſide they come forth, and run in a crooked line like an *ſ* down to the Bladder, into whoſe back and lower part they are inſerted not far from the Sphincter, running for an inch between its two proper Coats, to prevent the return of the Urine back this way. For when the Bladder is ſqueezed, its Coats clap cloſe together, and ſo ſhut up the mouths of the Ureters. *The Ureters.*

They are in *ſubſtance* much like a Vein, onely whiter and thicker, and more nervous. They are commonly held to conſiſt of two Coats, an inner which is proper, and an outer which is borrowed from the Rim of the Belly. They have ſmall Veins and Arteries from the neighbouring Veſſels, and ſlips of Nerves in a conſiderable number from the Intercoſtals, whence proceeds that intolerable ſenſe of pain when a ſtone ſticks in them. *Their ſubſtance, and Veſſels.*

They are indifferent large, having a hollowneſs through them which is ſo wide, that they will admit of a large ſtraw in a dead Horſe, and therefore may be conceived in a living Horſe to be much wider. Through theſe paſſages or hollowneſſes, the Urine doth paſs from the Kidneys to the Bladder, and that is their ſole and true *uſe*. *Their cavity and uſe.*

CHAP.

CHAP. XIX.

Of the Piſs-bladder, or Bladder of Urine.

The ſituation and ſubſtance of the Bladder.

THE Bladder of Urine is ſeated at the bottom of the Belly, in that hollowneſs that is formed of the *Os ſacrum*, Hips and the *Os pubis*, between the Coats of the Rim of the Belly; and is of a *ſubſtance* partly membranous, for ſtrength, extenſion and contraction; and partly fleſhy, for motion; for by its fleſhy Fibres are its Membranes contracted: and theſe fleſhy Fibres are wholly ſeated in its middle Coat, which is truly muſcular, as ſhall be ſhewed by and by.

Its Figure.

It is of a round globous *figure*, in ſhape like a Pear, having within it a large cavity or hollowneſs, wherein to contain the Urine.

Membranes.

It is compoſed of a treble *Coat* or Skin. The firſt and *outwardmoſt* of which it hath derived to it from the Rim of the Belly, which Skin is very ſtrong and cloſe. The *innermoſt* is thin, white and bright, of an exquiſite ſenſe, and is interwoven with all ſorts of Fibres, that it may the better bear inlarging and drawing up together, as need requireth. Within I have often found it covered with a mucous cruſt, which I take to be an Excrement of the third concoction of the Bladder, and to ſerve to defend it from being too much grated upon by the acrimony of the Urine. The *middle* betwixt theſe two, is as thick or thicker than them both, and is ſtuff with fleſhy Fibres, even as the ſame Coat of the Stomach and Womb are. Its Fibres run lengthways of the Bladder, and by contracting of themſelves ſqueeze out the Urine, forcing open the ſphincter Muſcle that encompaſſeth the neck of the Bladder.

Its perforations.

It hath three *perforations* or holes, two on the hinder part a little below the neck to let in the Urine from the Ureters, and one in the neck to let the Urine out.

Its parts and connexion.

The *parts* of the Bladder are two, its bottom and its neck. The bottom is its wider, more capacious part, and its neck, its narrower and more contracted. The bottom is faſt tied by a Membrane to the *Inteſtinum rectum* or Arſe-gut, and to the *Aorta* (a little before its diviſion) by the Umbilical Arteries, ſo that no violent motion can cauſe it to fall down upon its neck, which if it ſhould happen, would hinder the outgate of the Urine. The neck is narrower but longer in Horſes than in Mares, and in both it is fleſhy, being incompaſſed with a ſphincter Muſcle, which is woven with very many Fibres, ſome of which are ſtreight, and ſome overthwart, theſe laſt lying under the former. Now this ſphincter Muſcle ſeems to be nothing elſe but the middle Coat of the Bladder made thicker here than in any other part, by the acceſſion of the circular or overthwart Fibres. And its uſe is to purſe up the neck of the Bladder ſo, as no Urine can paſs out, till by its quantity or ſharpneſs it becomes ſo troubleſome to the Beaſt, as provokes him to force open the Sphincter by contracting the Muſcles of the Paunch, and the muſcular Coat of the Bladder. If this Sphincter happen to be overcooled, *&c.* the Horſe loſeth its uſe, and ſo for want of it his Water drops from him as faſt as it comes into the Bladder.

Its

Its *Veins* and *Arteries* proceed from the hypogaſtrick branches of the hollow Vein and great Artery, and are implanted into its neck, on which, part of them is ſpent, and the remainder runs through the bottom. Its Nerves come partly from the Intercoſtals and partly from the Marrow of that Bone of the Back that is called *Os ſacrum*, that is next to the Crupper. *Its Veſſels.*

The uſe of the Bladder is to receive the Urine from the Kidneys by the Ureters, and to contain it, like a Chamber-pot, till it is ſo full as to become troubleſome and uneaſy to the Beaſt; for as ſoon as it becomes ſo, by the help of the Muſcles of the Belly and the middle muſcular Coat of the Bladder it is preſſed out of it by piſſing. *Its Uſe.*

CHAP. XX.

Of the Yard and Sheath.

BEcauſe the *Yard* of ſton'd Horſes beſides its principal uſe which is to copulate with the Mare, has alſo an inferiour uſe, *viz.* to diſcharge the Urine out of the Bladder; and becauſe this latter is the ſole uſe of it in Geldings, we will here treat of it next to the Bladder, in reſpect to the office it performs to *it*, and not defer it, as many Anatomiſts of Humane Bodies do, till we have diſcourſed of the parts that prepare, make and retain the Seed, to which it alſo miniſters.

The Yard of an Horſe lies hid for the moſt part within the Sheath, from which, when it is drawn, it borrows its covering, conſiſting of the Scarf-skin and true Skin, and the carnous Membrane, which are common to it with other parts of the Body: Its *Glans* has a proper Membrane that inveſts it, as the *Glans* of a Man's Yard has; and the whole conſiſts of two Nervous bodies (which make up the greateſt part of its bulk) a Partition-skin that goes betwixt them, the *Urethra* or Piſs-pipe, the *Glans*, four Muſcles and the Veſſels; of which in order. *The parts of the Yard.*

The two *Nervous bodies* are encompaſſed with a thick, firm and white skin, but their inner ſubſtance is very ſpongy and flaggy unleſs diſtended and filled with bloud and ſpirit, conſiſting for the greateſt part of nothing but Veſſels, to wit, Veins, Arteries and Nervous threads, which are wonderfully interwoven one with another. They ariſe from the lower part of the Share-bone at a ſmall diſtance one from the other, giving the Piſs-pipe room to go betwixt them, but in a little while they meet together, and ſo are extended one by the ſide of the other the whole length of the Yard to the *Glans*, onely a thin skin coming betwixt them. At their riſe they reſemble the letter Y. *Its Nervous bodies.*

The *Piß-pipe* is ſeated betwixt theſe, or rather below them, and is of a ſubſtance much like them. On its inſide it is membranous and very ſenſible. It is continued from the neck of the Bladder, and is much of an equal width through its whole length. At its beginning where it is joined to the neck of the Bladder it has a membranous valve, that permits the Urine to come out, but hinders the Seed or any thing ſquirted *The Piſs-pipe*

into

into the Piſs-pipe to go in, unleſs it be forced open with a Probe or Catheter, or the like.

The Glans. Before the ends of the Nervous bodies there is prefixed the *Glans*, which is diſtinguiſhable from the reſt of the Yard by a round circle like a Crown going between them. This is of a more exquiſite ſenſe than the Nervous bodies, but of not much an unlike ſubſtance, though ſome ſay it is glandulous. When the Yard is drawn, it has no other covering, but one proper thin coat.

The Muſcles. The Yard has two *Muſcles* on each ſide at its root: The firſt pair are ſhort and thick, ſpringing from the knob of the Hip-bone, and are inſerted into the Nervous bodies near their beginning: they are called *Erectors*, becauſe they help the Yard to ſtand. The ſecond are longer and ſmaller, ariſing from the ſphincter Muſcle of the Arſe-hole, and paſſing along the ſides of the Piſs-pipe end about the middle of it, ſerving to open or widen it for the freer paſſage of the Seed and Urine, and are therefore called *Dilaters*.

The Veſſels. Its *Veins* and *Arteries* ſpring from the Hypogaſtricks, and enter it at the meeting of the Nervous bodies. Its *Nerves* come from the loweſt Vertebral.

Its Uſe. The principal and primary uſe of the Yard is for copulation, to convey the Seed into the Womb of the Female: but the ſecondary, and to ſuch Creatures as are gelt, the onely uſe of it, is to ſerve as a Tap to the Bladder, to let out the Urine when it becomes troubleſome; in which office the *Urethra* or Piſs-pipe is chiefly concerned.

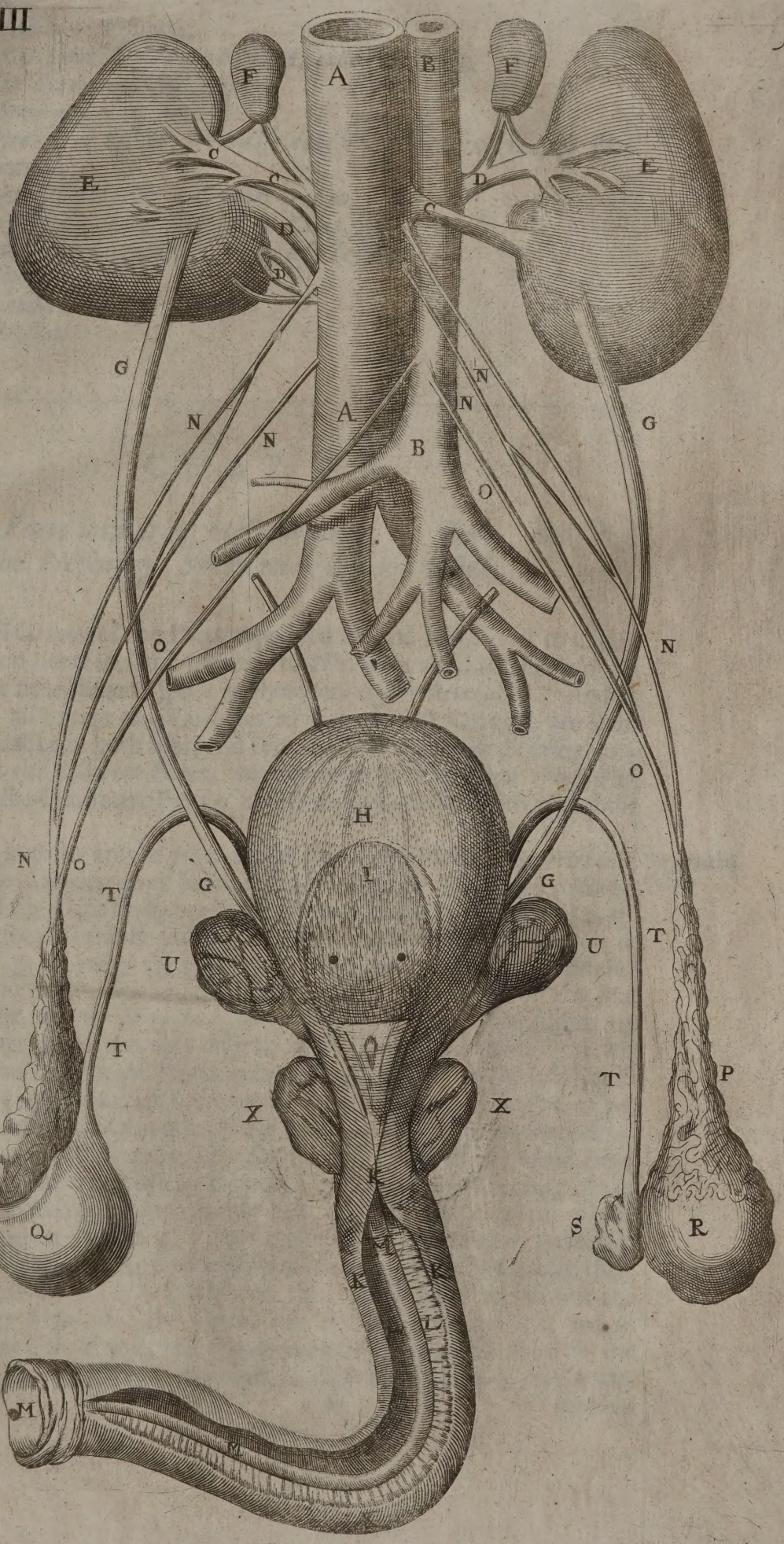
The Sheath. Except when the Yard is diſtended with bloud and Spirits, (which is called its erection or ſtanding) it lies hid in its Repoſitory, the *Sheath*, of which little need to be ſaid, ſeeing it is onely a duplicature of the common coverings of the Body, and conſiſts onely of the ſcarf and true Skin, and the fleſhy Membrane, which is here but thin. It ſeems to anſwer to the prepuce or Fore-skin in Men: for as that in ſome Men, when the Yard is erect, turns back towards the root of the *Penis* and leaves the *Glans* wholly bare; ſo when a Horſe's Yard is drawn out to the full length, the Sheath is alſo drawn out or unfolded, and appears to be knit to the Yard a little behind the *Glans*, even as the prepuce is to a Man's *Penis* at the ſame place. I ſhall not need therefore to ſpeak any more of it.

Table VIII. Sheweth the deſcending Trunks of the hollow Vein and great Artery, the Emulgents, Kidneys, Deputy-kidneys, Ureters, Bladder, Yard, preparing Veſſels, Stones, deferent Veſſels, Seed-bladders and Proſtates.

A *Sheweth the deſcending Trunk of the hollow Vein.*
B *The deſcending Trunk of the great Artery.*
CC *The emulgent Veins ariſing out of the hollow Vein.*
DD *The emulgent Arteries ſpringing out of the great Artery.*
EE *The Kidneys.*
FF *The Deputy-kidneys, otherwiſe called the black Choler Boxes.*
GGGG *The Ureters.*
H *The Bladder.*
I *The Bladder cut open that its inſide may appear.*
K *The neck of the Bladder where it opens into the Piß-pipe of the Yard.*
kk *The Ligaments of the Bladder.*

TAB VIII

fol. 42.



L *The Nervous bodies of the Yard divided from its back down to the Piſs-pipe.*
M *The* Urethra *or Piſs-pipe.*
m *The end or thickeſt part of the Yard, called its* Glans.
NNNN *The Seed-preparing Veins.*
OO *The Seed-preparing Arteries.*
PP *The Pyramidal bodies, otherwiſe called* Corpora varicoſa, *or* Pampiniformia.
Q *The right Teſticle with its inmoſt Coat on.*
R *The left Teſticle diveſted of all its Coats.*
S *The* Epididymis *or* paraſtata *of the left Teſticle.*
TT *The deferent Veſſels.*
UU *The Seed-bladders.*
XX *The Proſtates.*

CHAP. XXI.

Of the Parts miniſtring to Generation in Horſes, and Firſt of the Preparing, Spermatick or Seed-veſſels.

HAVING ſhewed the Parts appointed for and ſubſervient to Chylification, and in ſome meaſure to *Nutrition* and Sanguification, I come in the next place to ſpeak to thoſe ſerving for *Generation.* And as the former, all except the Yard treated of in the laſt Chapter, are common to and alike in both Male and Female; ſo theſe latter differing conſiderably in the different Sexes, we muſt treat of them apart: and ſhall begin with the Generative Parts of an *Horſe*, and afterwards treat of thoſe of a *Mare.*

The firſt in order are the *preparing* or *ſpermatick* Veſſels, *Arteries* and *Veins.* The Arteries carry bloud and vital ſpirit to the Stones to make Seed of, and the Veins bring back from thence ſo much of the bloud as remains ſuperfluous or unfit for that purpoſe. The Arteries ſpring out of the deſcending Trunk of the great Artery, almoſt two hands breadth below the Emulgents, one on each ſide: and the Veins out of the like Trunk of the hollow Vein, two on each ſide, a pretty deal higher up than the Arteries, as you may obſerve in the foregoing Figure. The left of theſe Veins in Humane Bodies commonly ſprings from the left Emulgent Vein, (and is but one) the reaſon whereof Anatomiſts give to be, leſt, if it ſhould have ſprung from the *Cava*, and thereby been neceſſitated to have marched over the great Artery, the return of the bloud from the Stones by it ſhould have been hindred by the continual beating of the Artery. But ſeeing Nature has not here made the like caution, where there was as great need of it, I cannot tell whether that be any ſatisfactory reaſon. Now theſe Arteries and Veins do at a little diſtance from their beginning meet with one another on their reſpective ſides, to wit the right Artery with the right Veins, and the left with the left, and at their meeting they acquire one common covering from the Rim of the belly, between whoſe two Membranes they deſcend down the Loins,

The preparing Veſſels.

running over the Ureters, as the figure ſhews. As they deſcend, they beſtow little twigs upon the Rim of the Belly, and the Veins do divide themſelves into ſeveral, and by and by unite again; but the Arteries paſs along a great way by one Pipe onely, though variouſly twiſted and interwoven with the Veins, with which yet they do no where inoſculate, or unite into one body, as was generally affirmed they did before the circulation of the bloud was found out. For till then it was believed, that the Veins carried bloud to the Stones, and the Arteries vital Spirits, and that the Arteries opened into the Veins, and contrarily the Veins into the Arteries, for the mixing the bloud and vital ſpirits together, and thereby preparing matter for the Stones to make Seed of. But ſince the circulation of the bloud was fully underſtood, and it became certain that bloud and ſpirit flowed to the Stones by the Arteries onely; upon a ſtrict enquiry after theſe inoſculations, they were no where to be found, nor is there any thing like them, ſaving that both Veins and Arteries paſs along in one common Cover, which it is likely gave occaſion to the miſtake. When theſe Veſſels are arrived within little leſs than a quarter of a yard of the Stones, the Arteries then begin to branch themſelves into ſeveral, but the Veins into far more. And both of them paſs out of the Belly by the hole of the proceſs of the Rim into the Cod. The ſpace betwixt where theſe Veſſels begin ſo much to divide themſelves, and the Stones, is called the *Pyramidal body*, becauſe from the Stones upwards, it grows ſmaller and ſmaller like a Pyramid, as is repreſented in the Figure. It is alſo called *Corpus varicoſum*, becauſe the Veſſels ſo divided make a thicker body; and laſtly *plexus pampiniformis*, the tendril-like *plexus* or interweaving, becauſe the Veins and Arteries twine and claſp about one another like the tendrils of Vines. Both of theſe Veſſels enter the Stones by ſeveral branches, but the Veins by a far greater number than the Arteries, which was neceſſary, for that the bloud flows very quick to the Stones by the Arteries, but returns but ſlowly back again by the Veins, and therefore it was convenient it ſhould have more conducts or chanels to run in.

Their uſe. The *uſe* of theſe *Preparing Veſſels* may be ſufficiently learned by what we have already diſcourſed of them, by which it is alſo clear that the name of *Preparers* belongs onely properly to the Arteries that carry bloud and ſpirits to the Stones to nouriſh them and to make Seed of, and not at all to the Veins, which onely bring back that bloud that is not converted to thoſe uſes.

As for the *Nerves* and *Lympheducts* that run with the aforeſaid Veſſels to the Teſticles, becauſe the Teſticles are the parts for which they are deſigned, and they are onely in their paſſage thither while they accompany theſe Veins and Arteries, we ſhall ſay nothing further of them here, but ſhall ſhew their origine and uſe in the following Chapter.

CHAP.

CHAP. XXII.

Of the Teſticles or Stones, and the Paraſtatæ *or Attenders.*

THE Teſticles or Stones are called in Latin *Teſtes*, which otherwiſe ſignifies Witneſſes, becauſe they witneſs the ſtrength and courage of the Creature; or perhaps rather, as ſome think, becauſe no Man amongſt the Romans was admitted to be a Witneſs that had loſt his Stones. They are always according to Nature two, and therefore the Greeks call them by a word that ſignifies *Twins*. *Their name.*

They are of an oval *figure*, but ſomewhat flattiſh: and their *ſubſtance* has been formerly held to be glandulous, as if they were onely two great Kernels, not differing from other Kernels in other parts of the Body ſaving in bigneſs and uſe. But later Anatomiſts have diſcovered them to be of no ſuch ſolid ſubſtance as Glands are, but wholly to conſiſt of Veſſels that twiſt and twine this way and that way, and are kept in their order cloſe to one another by the inmoſt Skin that cloaths the Stones. When they are cut in two, they appear not red, but of that colour the Seed is of, becauſe the bloud as ſoon as it enters them, begins to loſe its colour and nature, and to be turned into Seed. And ſeeing I could never obſerve any bloud in the Stones, it is likely that the Veins reach no further than their Coats, ſeeing the Seed is not received into the Veins, but into peculiar Veſſels called *Deferent* or back-carrying, of which in the next Chapter. I ſay, I believe the Veins onely run through the Coats of the Stones, and have the ſuperfluous bloud tranſmitted into them from the Arteries, before ever they enter into the body of the Stones: And then thoſe Veſſels that the Teſticles conſiſt of, will onely be Arteries, run out into very fine and almoſt innumerable threads, for the elaborating of the Seed. *Their ſhape and ſubſtance.*

If this notion of mine be true, then I may ſay that both *Veins* and *Arteries* run through all the Coats wherewith the Teſticles are inveſted, but that they themſelves have no Bloud-veſſels but Arteries. And whether they have any other ſort of Veſſel, is uncertain. 'Tis true there are both *Nerves* and *Lympheducts* that come towards the Stones, as I obſerved in the foregoing Chapter; but I queſtion whether they reach any farther than their Coats any more than the Veins. As for the *Nerves*, they ſpring from a Vertebral pair according to ſome, from the Intercoſtal ſay others, and a third ſort think from both. But be their original where it will, I think they are moſtly if not altogether ſpent upon the ſuſpending Muſcles by which the Teſticles are ſuſtained, and upon the Coats ſo often mentioned. So far am I from thinking with ſome, that theſe Nerves contribute the greateſt or any conſiderable ſhare of matter for the making of the Seed. The *Lympheducts* ſpring manifeſtly from amongſt the Coats of the Stones, and aſcend up into the Belly by the ſame hole, by which the preparing Veſſels came down, running ſo far till they reach and empty themſelves into the common Receptacle of the Chyle, deſcribed above *chap.* 10. and 12. *Their Veſſels.*

The Teſticles being ſenſible, tender and noble parts, are defended from the external cold or other Injuries by ſeveral *Coats*, of which ſome are *Their Coats.*

common to them with other parts of the Body, and ſome proper to themſelves onely. The *common* incompaſs both the Stones within one cavity, as in a Bag, and make that which we call the Cod. And theſe are two. The outer of them is the Skin with its Scarf-skin, and the inner the fleſhy Membrane. The outer is not divided as it is in Man, by a line that runs along the middle of it lengthways. The inner, as it ſticks pretty cloſe to this on one ſide; ſo to the next proper one ſomewhat looſely, by many membranous Fibres, on the other or inner ſide. The *proper* are alſo two, though by ſome they are reckoned to be three. The outmoſt is called *Vaginalis*, or the Sheath-like Coat, becauſe the Stone is included in it as in a Sheath. This is thick and ſtrong; ſmooth on the inſide, but rough on the outſide, by reaſon of many Fibres or Threads by which it is knit to the inner of the common Coats. It is full of Veins, and is a production of the Rim of the Belly: for as the preparing Veſſels deſcend over the Share-bone into the Cod, the Rim makes a Caſe for them for their defence and ſecurity, and reaches with them down to the Stone, encompaſſing *it* as well as *them*. Into this Coat is the Muſcle inſerted that ſuſpends the Stone, (which we ſhall deſcribe preſently.) Some make two Coats of this, the outmoſt of which retains the name of *ſheath-like* above-mentioned; and the inner they call the *red* Coat, from its colour; but indeed this latter is nothing elſe but the foreſaid Muſcle ſpreading it ſelf broad and thin on the Sheath-like Coat. The laſt and inmoſt, which immediately cloaths the Stone, (being the ſecond proper one) is called the *nervous*, and otherwiſe the *white*, Membrane, being thick and ſtrong, and of a whitiſh colour. It ſeems to ariſe from the outer Coat of the preparing Veſſels, and is rough on its inſide next the Stone, but ſmooth and ſlippery on its outſide.

Their Muſcles. Each Stone is ſuſpended or hangs by a Muſcle called *Cremaſter*, or the ſuſpender. Theſe Muſcles ariſe from the Ligament of the Share-bone, and deſcending by the proceſs of the Rim of the Belly (before ſpoken of) are inſerted into the Sheath-like Coat, which they ſtrengthen, the better to ſuſtain the weight of the Stones; and in the act of Copulation are ſaid to pull up the Stones, and thereby to ſhorten the ways the Seed has to paſs.

Paraſtatæ. On the top or back as it were of each Stone there lies a longiſh, whitiſh and ſomewhat round body, diſtinguiſhable very eaſily from them, though not of much an unlike ſubſtance; onely they are not ſo firm and compact as the Stones are. They are named *Paraſtatæ* or *Attenders*, becauſe they wait as it were on the Stones; and alſo *Epididymidæ*, becauſe they are placed *upon the didymi* or Twins, by which name the Stones are otherwiſe called. They conſiſt (as the Stones do) wholly of Veſſels running this way and that way, all which are united into one Thread or Chord, which is continued into the deferent Veſſel, of which in the next Chapter.

The uſe of the Stones and Paraſtatæ. From what has been already diſcourſed of theſe Parts, their *uſe* appears to be, to make and elaborate the Seed, for the propagation of the kind. Now the Matter out of which the Seed is made, ſeems to be onely the Arterial bloud, unleſs one ſhould admit ſome Animal ſpirits conveyed hither by the Nerves and mixed therewith. But ſeeing any inoſculations of the Nerves with the Arteries is a thing not yet diſcovered either in theſe or any other parts, I incline to believe that the Nerves onely contribute ſenſe to theſe parts, that the Animal may have the greater pleaſure in

in Copulation. A ſecondary uſe or rather effect of the Stones, is to cauſe courage and generoſity in the Horſe; for we obſerve that our Ston'd Horſes are generally much higher-ſpirited than Geldings.

CHAP. XXIII.

Of the Deferent or Ejaculatory Veſſels, the Seed-bladders and the Proſtates.

HAVING done with thoſe Parts that prepare and elaborate the Seed, we come next to thoſe that are the Store-houſes or Repoſitories of it, from whence it is ejected in Copulation. And of theſe the firſt are the *deferent* or back-carrying veſſels, otherwiſe called *Ejaculatory* or ſquirting, becauſe in thoſe Animals that have no Seed-bladders to ſtore up the Seed in (ſuch as Dogs and the like) it does immediately ſquirt through theſe Veſſels from the Stones in Copulation: though in others that have Seed-bladders (as Horſes have) it is continually a-paſſing by theſe Veſſels from the Stones to the Bladders by little and little as it is prepared.

Theſe *deferent Veſſels* are two, one on each ſide; they begin at the ſmaller end of the *paraſtatæ* (deſcribed in the former chapter) and are indeed but a continuation of them. They are whitiſh and pretty hard; not hollow like a Vein, but more like a Nerve, for their cavity is hardly diſcernable, unleſs the Seed-bladders be full of Seed, and ſo it regurgitate as it were into theſe Veſſels, as I have ſometimes obſerved. As ſoon as they are ariſen from the *Paraſtatæ*, they aſcend ſtreight out of the Cod into the Belly by the ſame proceſs of the Rim of the Belly by which the preparing Veſſels deſcended. Being entred the Belly, by and by they croſs over the Ureters from the outſide to the inſide of them, and taking a little compaſs they turn back again under the Bladder till they arrive almoſt at its neck, (towards which they grow wider than before) and there their ſides open into the Seed-bladders, into which they deſtill the Seed; notwithſtanding themſelves ſtill keep on their courſe as far as the Piſs-pipe between the Proſtates, but are grown much ſmaller before they reach them. Theſe Veſſels ſerve as Conduit-pipes for the Seed to drill along from the Stones to the ſeminal Bladders; and through their necks, that reach from the Bladders to the Piſs-pipe, does the Seed iſſue in the act of generation. *Deferent Veſſels.*

The place where the Seed is ſtored up and preſerved, is the *Seed-bladders.* Dr. *Wharton* affirms that in an Horſe "they conſiſt of *two* parts, "of which *one* is a mere membranous or skinny Bladder, the *other* glan- "dulous. The Bladder, he ſays, he has found ſix inches long and near "three broad, although it was empty and not opened; but it ſeem'd ca- "pable of being ſtretched out to a greater length and width, if it had "been filled. If one opened the bottom of this Bladder, and put a Probe "into it, the Probe paſſed obliquely towards the Piſs-pipe, and entred "into it through the ſame hole with the deferent Veſſel of the ſame ſide. *Seed-bladders.*

"The

"The *other* part of theſe Bladders, which we called glandulous, was "thicker, and broader on that ſide which joyned to the Piſs-pipe; and "where the deferent Veſſels were inſerted, without deſcending towards "the bottom, it grew thinner and thinner like a wedge. The ſubſtance "of this glandule was not much unlike to that of the Stones, but of a "more clayie colour, and had holes within it ſo apparent that they would "admit an indifferent Probe: all which holes were united into one com-"mon duct, namely before they reach the *Urethra*. For putting a Probe "into any one of the ſaid holes, it was driven eaſily and without any lett "into that common paſſage. But the paſſage it ſelf did not quite pene-"trate the Piſs-pipe, but was covered with the thin and ſpongie Mem-"brane of the *Urethra*. Through this Membrane is the ſpermatick Mat-"ter ſtrained in Copulation. Thus far Dr. *Wharton* in his 30. chap. *of the Glands*. Now as for my ſelf, I could never obſerve ſo great a diffe-rence of one part of the ſeminal Bladders from another, as that one ſhould appear membranous and the other glandulous. And I would not imagine that ſo skilfull an Anatomiſt ſhould miſtake the Proſtates for a part of the ſaid Bladders, though theſe are the onely Parts that to me appear glandu-lous thereabouts. All the Seed-bladders that I have obſerved have been much of a like ſubſtance, though perhaps a little thicker in one place than another: they are whitiſh and very ſtrong, being within all full of little Cells like Pomegranates. They have no communication the one with the other; for as their bottoms or thicker ends bunch out a little on each ſide of the Bladder (as you ſee in the Figure) ſo their ſmaller ends or mouths, that are neareſt to one another, do each of them open apart into the deferent Veſſel of their reſpective ſide, by whoſe neck they pour out their Seed in Copulation into the Piſs-pipe. The Seed comes into them out of the deferent Veſſels, and goes out of them again into the ſame Veſſels, at one and the ſame paſſage or orifice. Dr. *Wharton* ſays, that the ſeminal Matter contained in them differs much from that which is made in the Stones: whence he concludes that the Seed-bladders receive not the *matter* which they contain, from the Teſticles by the deferent Veſſels, but do elaborate it in their own glandulous ſubſtance; and he calls it *Seed of a peculiar kind*. For my own part I have not diſcovered any difference, to ſpeak of, betwixt this and that which I have ſome-times ſeen in the deferent Veſſels, when the Bladders have been very full; nor is it probable they can be of a different kind or nature, ſeeing there is that manifeſt communication between the deferent Veſſels and the Bladders, that theſe latter ſeem to contain or receive nothing, but what the former bring into them. Nor do I think that any Part does elabo-rate any Liquor that can with any propriety be called Seed, except the Teſticles contained in the Cod, whoſe ſole office and prerogative it is to make it.

Their uſe. The *uſe* of theſe Bladders (as hath been ſaid) is to receive the Seed from the deferent Veſſels, and to reſerve it untill the time of Copulation. Now the Seed may (to ſatisfy the curioſity of the Ingenious Anatomiſt) be plainly ſeen, if you take the Bladders in your hand and ſqueeze them with your finger; for by ſuch ſqueezing you ſhall force the ſeminal Mat-ter into the Pipe of the Yard, where you may by diſſecting the Yard or opening that Pipe plainly ſee it. Or if you think it too much to take that pains, you may by diſſecting the Bladders themſelves ſee it; but then you loſe the ſight of one of the curious contrivances of Nature,

which

which is a little Caruncle or Kernel that is placed at the mouth of the hole where the Seed diſtills into the Yard, which Caruncle is by Nature placed there, to prevent the iſſuing forth of the Seed when there was no need for it; for the continual gleeting of it, which would have happened but for this Caruncle, would be extremely prejudicial to the Creature. This Caruncle in Men being impaired or injured by the Venereal Diſtemper, or by their overſtraining themſelves in the act of Copulation, is generally by Phyſicians believed to be the cauſe of the running of the Reins. And this Diſeaſe Horſes are not exempted from, although it doth not happen to them on the like occaſions as to men it doth; for this Diſeaſe, which in Horſes we call the mattering of the Yard, happens to them upon their catching ſuddain colds after hard riding: Likewiſe over-hard riding it ſelf will bring it; and very often it is cauſed by weakneſs occaſioned by great poverty and the like.

In the next place we come to the *Proſtates*, which are ſo called from their *ſtanding before* the Seed-bladders. They are Glandulous bodies, almoſt of the ſame nature and ſubſtance as other Glandules of the Body. They are ſituated at the root of the Yard above the ſphincter Muſcle of the Bladder, being in number two, on each ſide of the neck of the Bladder one; their quantity about the bigneſs of a ſmall Burgamy Pear. They are of an oval figure, onely ſomewhat flat, and are covered with a very thick Coat to hinder the oily ſubſtance with which they are well ſtored, from iſſuing forth. *The Proſtates. Their ſeat, bigneſs and ſhape.*

They have Veins, Arteries, Nerves and Lympheducts; and beſides, many Pores that open into the *Urethra*. In moſt Creatures, eſpecially the leſſer ſort, theſe Pores are ſcarcely diſcernible in an healthfull ſtate, but in an Horſe they are very plain, and open into the upper part of the Piſs-pipe about an inch diſtance from the inſertion of the deferent Veſſels into the ſame. Dr. *Wharton* has told twelve ſuch little holes, before each of which as they open into the Piſs-pipe, is placed a little Gland, about the bigneſs of a grain of Muſtard-ſeed, which ſerve to hinder the entrance of the Urine into theſe holes, as it runs by them out of the Bladder. *Their Veſſels and Pores.*

The nature and *uſe* of the Liquor that is contained in theſe Proſtates, and that iſſues out of them into the Piſs-pipe, is ſomewhat difficult to determine. Some take them to be a kind of Teſticles, and think that they make a ſort of Seed, which though it be not of ſo noble a nature as that which is made in the Teſticles contained in the Cod, yet is as neceſſary for generation: ſeeing ſuch Men as are cut for the Stone become incapable of generation, if the Stone be ſo big and ragged as much to tear the Proſtates in pulling of it out. But it is likely, ſuch barrenneſs happens not ſo much from the tearing of theſe, as that the ends of the deferent Veſſels are torn likewiſe, or it may be the Seed-bladders alſo: and ſo when the Wound is healed up again, the ſides of theſe Veſſels grow together, ſo that they can neither contain nor convey into the Piſs-pipe any Seed. It is probable therefore that this oily clammy Humour that the Proſtates diſcharge into the Piſs-pipe, is of a nature far different from that of Seed, even as themſelves are bodies of a far other nature than the Stones are. For, as was ſhewn above, the Stones are wholly vaſcular, that is, conſiſt wholly of Veſſels; whereas theſe are glandulous, or kernelly. So that I believe this Humour ſerves onely to make the *Urethra* ſupple and ſlippery, and to defend it from the acrimony or ſharpneſs of the Urine. *Their uſe.*

And

And thus we have done with all the Parts that make or retain the Seed: as for the Yard, which ſome treat of in this place, becauſe it ſerves for injecting the Seed into the Womb; we deſcribed the Parts thereof above *chap.* 20. next to the Bladder, becauſe it ſerves as well for making water as for Copulation, and thither the Reader may pleaſe to turn back.

CHAP. XXIV.

Of the Parts miniſtring to Generation in Mares, and Firſt of the Preparing Veſſels, ſo called.

IT was *Galen*'s opinion, and from his authority, of many others, that the Parts ſerving for generation in the Female differed not from thoſe of the Male ſaving in ſituation; the Male's Genitals being without the Body, and the Females within. And this diverſity of ſituation they attributed to defect of heat in the Female, ſo that the Genitals could not be thruſt out of the Body as in the Male they are. But the truth is, they differ not onely in ſituation, but in number, bigneſs, figure, office and uſe, as will be apparent as well from the deſcription of them, as from their repreſentation in the Figures.

Preparing Veſſels. The firſt in order are the preparing Veſſels, Arteries and Veins. In theſe it was till of late believed that the bloud was prepared for the Stones the readilier to be turned by them into Seed. But as when we treated above of the preparing Veſſels of the Horſe, we ſhewed that the Veins could not properly be called *preparing* Veſſels, becauſe they carry nothing to the Stones, but bring bloud back again from them: ſo in Mares we cannot allow the name of *preparers* or *ſpermatick* to be proper even to the Arteries themſelves, ſeeing neither Mares nor any other Females have any true Seed. For their Stones are but improperly ſo called, being more truly Ovaries or Egg-beds, as we ſhall ſhew by and by in the next Chapter. However we ſhall retain the old name for diſtinction's ſake, and ſtill call both Veins and Arteries *preparing Veſſels*.

1. *Arteries.* The preparing Arteries of the Horſe we ſhewed to be onely two, one on each ſide; but in the Mare there are ſeveral, three or more on each ſide. All of them ariſe out of the great Artery, below the Emulgents, ſome higher, ſome lower. They paſs down along with the Veins of their reſpective ſides, with which they are very much interwoven, but no where open one into the other. Some branches of them go to the Teſticles, ſome to the Horns of the Womb, and ſome to its Sheath.

2. *Veins.* The preparing Veins in the Horſe were two of each ſide, though the Arteries were but one; yet in the Mare where the Arteries are ſeveral, the Veins are but one of each ſide. The reaſon whereof ſeems to be, That the Arteries in the Mare being not ſo much intended for the nouriſhment of her Genitals as of the Foal contained in her Womb, it was requiſite there ſhould be ſeveral Veſſels for the bringing the greater plenty of *nouriſhing juice* for it; all or the greateſt part of which being received by the Foal, there was not need of the like number of Veins to carry back

back the bloud that came along with it, that being very inconſiderable for its quantity to what was imported by the Arteries. But now all the bloud brought by the preparing Arteries of the Horſe, ſerving for no other uſe but for the nouriſhment of the Genitals, and for the making of Seed: *As* a leſs quantity of bloud will ſuffice for theſe two uſes, and ſo there is no need of a plurality of Arteries; *ſo* the bloud that is brought to the Genitals, is but a very ſmall part of it ſpent in performing theſe two offices, and therefore more Veins were neceſſary to carry the ſurpluſage back again, ſeeing the motion of the bloud in the Arteries is far quicker than of that in the Veins. Theſe *two* preparing Veins then ariſe out of the *Cava* a little below the Emulgents, and neither of them from the Emulgent it ſelf, any more than in the Horſe, though in Men and Women the Left generally ſprings from the left Emulgent. They join in like manner with the Arteries as we ſhewed above that they did in Horſes, and go to all thoſe parts of the Genitals to which we juſt now ſhewed that the Arteries run.

When the Mare is not with Foal, the Arteries bring onely bloud for the nouriſhment of the ſeveral Parts into which they are inſerted: but when ſhe is with Foal, they bring beſides the bloud a nutritious juice, (which is Chyle, impregnated with ſpirit, but not as yet perfectly changed into bloud) for its growth and nouriſhment, as we ſhall ſhew more afterwards when we come to ſpeak how the Foal is nouriſhed in the Womb. And whether ſhe be with Foal or not, the Veins ſerve to carry back to the *Cava* and ſo to the Heart, the bloud that is ſuperfluous. *Their uſe.*

CHAP. XXV.

Of the Teſticles or Stones in Mares, otherwiſe called Ovaries; and of the Trumpets of the Womb.

THE *Teſticles* in Mares do not agree in their deſcription with thoſe of Horſes in any one particular thing, nor ſhould I call them by that name, if the general miſtake of ſo many Ages (in thinking the Female's Stones to have the ſame office with thoſe of the Male) had not made it neceſſary to retain that appellation, if I would be underſtood by vulgar Readers of what part I am treating. For it has been an old Opinion, that the Male and Female's Seed being mixed in the Womb, doth make the Conception; and there are many that will not *yet* be beaten out of it. Whereas the Female hath no Seed at all, but their Teſticles (ſo called) are as it were knots of Eggs, which being impregnated by the Male's Seed, one or more at a time, do each make a Conception. But of this more by and by. *The Teſticles.*

The Mare's Teſticles differ from the Horſe's in theſe Particulars.

Firſt, The Horſe's Stones hang without the Body in the Cod, but the Mare's lie within the cavity of the Belly, a little diſtance from the horns of the Womb, to which they are knit by a ſtrong Ligament. *Their ſituation.*

Bigneſs, and figure. Secondly, The Mare's Teſticles are hardly half as big as the Horſe's, nor are they of the ſame ſhape, but more flat and thin, having no *Paraſtatæ* upon them. And beſides, they are ſomewhat uneven in their ſurface, whereas thoſe of an Horſe are ſmooth.

Coat. Thirdly, The Horſes Teſticles are covered with four Coats, two common, and two proper; but the Mare's are clad onely with one for about one half of them, and the other half with two; the outer of which they have immediately from the preparing Veſſels that enter into them, but mediately from the Rim of the Belly.

Subſtance, and uſe. Fourthly and laſtly, They differ very much from one another in their ſubſtance and uſe. For we ſhewed above in *chap.* 22. that the Horſe's Stones did wholly conſiſt of Seed-veſſels turn'd and roll'd this way and that way: but the Mare's conſiſt principally of numerous Membranes and ſmall Fibres looſely united to one another; amongſt which there are ſeveral little Bladders, about as big as a Peaſe, ſome bigger, ſome leſs, that are full of a very clear and thin liquor. Thoſe that were of opinion that the Females made Seed as well as the Males, thought that theſe Bladders that are chiefly in the ſurface of the Teſticle, anſwered to the Seed-bladders in the Male, and that the humour contained in them was true Seed. And whereas it might be objected that it is far more clear and watery than the Male's Seed, they thought it ſufficient to anſwer, that that was from the colder and moiſter nature of the Female, that could not concoct it to that conſiſtency as the Male's is of. But the truth is, it is not Seed; and if it were, there is no way whereby it could poſſibly arrive at the Womb. For that which was reputed to be the deferent Veſſel, appears to be nothing elſe but a ſhort and broad Ligament for fixing the Teſticle in its place; for it has no cavity at all, but is of a ſolid, firm and cloſe ſubſtance. Theſe Bladders therefore muſt be concluded to be Eggs, anſwering to thoſe of Fowl and other Creatures: which will be the more manifeſt if you boil them, for then, as thoſe that have tried it do affirm, they will have the ſame colour, taſte and conſiſtency with the whites of Hens-eggs. Whence theſe Teſticles may more properly be called *Ovaries* or Egg-beds, whoſe Eggs are nouriſhed by the Bloud-veſſels deſcribed in the foregoing Chapter; and when upon Copulation one (or more) of them is made fruitfull by the Male's Seed, it ſeparates from the reſt, and being received by the mouth of the Trumpet of the Womb, it deſcends by it into the Horn, and ſo to the bottom of the Womb, and there becomes a Conception. And whereas it has been thought a ſtrong argument for the Female's having true Seed, and that theſe Teſticles made it, in that when they are cut out of the Body in Bitches, Hogs, or any other Creature, ſuch Creatures are always barren afterwards; this new Opinion ſhews that there is no ſtrength or certainty at all in that argument. For granting, what is moſt certainly true, that Females that are gelt or ſpay'd, have never any Young after; yet it does not at all follow, that therefore their Stones make and conſerve Seed; but onely that they contain ſomething that is abſolutely neceſſary for generation and conception: but whether that be Seed or ſomewhat elſe, is indifferent. And therefore that Argument will be as ſtrong for the Opinion that the Teſticles are *Ovaries*, ſeeing without the Eggs it is ſo far from poſſible that there ſhould be a conception, that they are the very conception it ſelf.

Of the *Bloud-veſſels* that run through the Teſticles we treated in the foregoing Chapter under the name of Preparing Veſſels: As for their

Nerves,

Nerves, they ſpring from the Intercoſtal pair, and from the Nerves of *Os ſacrum*. *Bartholin* affirms that they have alſo *Lymphedu&cts*.

The Trumpets of the Womb.

There hath not been greater diſpute about the matter of the Conception, than by what way any thing could go to the Womb or its Horns from the Teſticles to make it. Some have pretended to the diſcovery of Veſſels or Pipes for conveyance thereof, which others altogether as skilfull Anatomiſts could find no footſteps of. At laſt *Fallopius* aſſigned this office to two Du&cts, which from their ſhape he called *Tubæ* or Trumpets; and from him (as being the firſt Inventer of them, or at leaſt the firſt that aſcribed this uſe to them) they are commonly known by the name of the Fallopian Trumpets. He ſays, "they are nervous and white, "ariſing from the Horns of the Womb, where they are very ſlender, but "at a ſmall diſtance from it they grow wider, bending this way and that "way, till near their end, where ceaſing their winding they grow pretty "large, and ſeem ſomewhat carnous.] Their ends next the Teſticles are torn and jagged, and lie looſe, being freed from the Membrane that ſuſtains them the greateſt part of their length.

Their ſubſtance, capacity and length.

Their *ſubſtance* ſeems rather membranous than nervous, (as *Fallopius* would have it.) And they conſiſt of two *Membranes*; the *inner* is propagated from the inmoſt Tunicle of the Womb, and the *outer* from the outmoſt of the ſame. Where they are wideſt they will admit ones little finger, but towards the Horn of the Womb, they are not ſo thick as an ordinary ſtraw, but yet are pervious; and where they open into the inſide of the Horn, their Orifice looks like a little Teat. As to their length, it is ſomething difficult to determine it exactly, becauſe they run ſo to and again in their courſe; but I believe they are very near a quarter of a yard long.

Their uſe.

Their *uſe* is, *both* to ſerve as two Funnels whereby ſome ſubtile particles or ſteams may iſſue from the Seed, that is injected by the Male into the Womb, to the Teſticles of the Female for the fecundating or making fruitfull the Eggs thereof, one or more, according to the different ſpecies of living Creatures; (but it is very rare, that there is above one ſo impregnated in a Mare, ſeeing it is ſo ſeldom that any brings forth twins:) *and alſo* when the Egg is fecundated by this means, and growing ripe as it were, drops off or ſeparates from the Teſticle, it is received by the jagged mouth of the Trumpet, along which it paſſes till it arrive in the Horn of the Womb, into which (as was ſaid above) the Trumpet is inſerted; and on this conſideration the old name of *deferent Veſſels* may ſtill be granted them, from their conducting the Eggs from the Teſticle to the Womb. Now ſeeing the wide ends of the Trumpets that firſt receive the Eggs lie looſe, and are not faſtened to the Teſticle, it is probable that in Copulation theſe become turgid as well as all the other parts of the Genital, and with their jagged mouths claſp hold upon the *Teſtes* (as a Lamprey's mouth faſtens upon a ſtone) and ſo convey to them a ſeminal air, and afterwards receive from them a fecundated Egg.

CHAP. XXVI.

Of the Womb and its Horns.

The ſhape and parts of the Womb.

THE Womb of a Mare is ſhaped much like the Greek Letter ϒ, in which the ſingle ſtroak that is ſtreight, anſwers to the *vagina* or Sheath, which receives the Horſe's Yard in Copulation, and the two crooked ſtroaks that turn one the one way, and the other the other, are called *Horns*, becauſe they in ſome ſort reſemble them; and that part of the Sheath where the Horns begin to ſeparate, being ſomewhat wider than the reſt, is the *fundus* or bottom of the Womb, where the Foal lies. For though in Dogs, Rabbets, &c. that have many young ones at one time, their burthen is contained wholly in the Horns of the Womb, as well as the Conception is firſt made there; yet in a Mare that commonly brings forth but one at a time, it is otherwiſe; for there is little or nothing that belongs to the Foal, contained in them, except ſome part of the Skins wherein the Foal is covered while it is in the Womb.

Its ſituation. The Womb is ſeated in the loweſt part of the Lower Belly, in that wide Cavity that is formed out of and invironed with the Hip-bones, the Share-bone, and the *os ſacrum*. It is placed betwixt the Piſs-bladder and the Arſe-gut, and is firmly tied in its place by two pair of *Ligaments*.

Ligaments. The firſt *pair* ariſe from the Rim of the Belly, being ſhorter by much than the other, but broader, being for their ſhape reſembled to Bat's wings. They are of a membranous, looſe and ſoft ſubſtance, and are inſerted into the Horns of the Womb, taking hold alſo of the Teſticles, and tying them both faſt to the Hip-bones, from whence they ſpring.

The ſecond *pair* of Ligaments ſpring from the bottom of the Womb, and are called the round or worm-like Ligaments. They aſcend on each ſide between the two Coats of the Rim of the Belly, towards the Share-bone, over which they paſs ſlantingly, and then parting into many jags as it were, they end near the *clitoris*. This alſo ſerves to faſten the Womb the more firmly in its place.

Subſtance. It is of a nervous or rather membranous ſubſtance, more compact and cloſe in Mares that are not with Foal, but more ſpongie in ſuch as are. It conſiſts of two Membranes, and a certain fleſhy or fibrous parenchyma or ſubſtance between, unleſs one will make this a third Membrane. The outmoſt Membrane is borrowed from the Rim of the Belly, and therefore is truly double as that is, though we reckon it but for one. This is very ſtrong. The inmoſt is not ſo ſtrong nor firm as it, but ſeems to be ſomewhat porous. The middle ſubſtance betwixt theſe two is that which makes up the greateſt part of its thickneſs at all times, but particularly when the Mare is with Foal, it imbibes ſo much of the nutritious Juice that flows plentifully hither at that time, that it is ſtuft up to almoſt an inch thickneſs.

Veſſels.
1. Arteries. Its *Arteries* are branches partly of the Preparing Arteries and partly of the hypogaſtrick. Theſe do inoſculate or communicate by open mouths one with another, but not ſo with the Veins. They run along the Womb bending and winding, and not in a ſtreight courſe, leſt they ſhould be broken

broken when the Womb is extended to that vaſt bulk as it is when the Mare is with Foal.

Its *Veins* ſpring alſo from the preparing and hypogaſtrick Veins, but are much fewer in number than the Arteries. For Nature having formed theſe Parts not ſo much for the benefit of the Individual, as for propagating the Kind; and the Foal while it is in the Womb receiving no nouriſhment but what is brought to it by the Arteries, it was neceſſary that they ſhould be large and numerous for conveying the greater plenty of it: but ſeeing the greateſt part of that which is brought by the Arteries is ſpent in the nouriſhment of the Young and the Parts in which it is contained, a fewer number of Veins are ſufficient to convey back again what is not ſo ſpent. The Veins do inoſculate with one another like as the Arteries did. 2. *Veins.*

It has *Nerves* from the Intercoſtal pair, and from the Nerves of *os ſacrum.* 3. *Nerves.*

Some have alſo obſerved many *Lympheducts* creeping along its ſurface, which one after another meeting into one, empty themſelves into the common receptacle of the Chyle and *Lympha*; and theſe *Lympheducts* ſome have miſtaken for Milky-veins. 4. *Lympheducts.*

Thus much of the *Womb* properly ſo called: and what we have ſaid hereof, may be all applied to its *Horns* likewiſe as to their *ſubſtance* and *veſſels.* As for their *figure*, you may view it in the following Cut. Theſe Horns are leſs in Mares than in any other Creature that has them, in proportion to the bigneſs of their Bodies. From their firſt riſe from the Womb to their end, they grow by degrees narrower and narrower, and about their middle are the Trumpets of the Womb inſerted into them. They have a worm-like or ſucceſſive motion as the Guts have, by which the Egg being received from the Trumpet is driven gently along till it come to the bottom of the Womb in Mares, and there becomes a Conception: but in ſuch Creatures as bring forth many Young at one time, the Conceptions ſtay in the Horns till they are come to maturity, and never deſcend into the bottom of the Womb till they are about to be excluded. *Its Horns.*

By what has been ſaid, it appears, that the *uſe* of the Womb is to receive the Seed of the Male, from which Seed a certain air or ſpirit ſteams through the Trumpets to the Teſticles, where impregnating one or more Eggs, thoſe that are ſo impregnated, are conveyed by the Trumpets into the Horns, and by theſe into the bottom of the Womb, where they become Conceptions, and ſtay (according to Nature) ſo long till all their Parts are finiſhed, and they are become perfect Animals of their proper kind; and then the Womb being irritated by the motion and bigneſs of the Young, does by the help of the Muſcles of the Belly, and the aſſiſtance of the Midriff exclude it. But having deſigned a particular diſcourſe of the generation of Animals to be annexed to this Treatiſe, we ſhall purſue it no further here. *Its uſe.*

CHAP.

CHAP. XXVII.

Of the Vagina *or Sheath of the Womb, the Caruncles call'd* myrtiformes, *(of the ſhape of Myrtle-berries) the* Clitoris *and the external Privity.*

The Vagina *or Sheath.*

WE ſhall not need to enter upon the deſcription of the Veſſels running through the *Sheath* of the Womb, they being wholly the ſame that are diſperſed through the Womb it ſelf, and therefore the Reader may have recourſe to the former Chapter for them: nor is it neceſſary to ſpeak much of its ſubſtance, that being alſo much like to that of the Womb, though not ſo thick and ſtrong, but more ſoft, nervous and ſpongie. It is near half a yard long, being much of an equal width from one end to the other, but very uneven and wrinkled in its inner ſurface. Into its lower ſide (or that ſide next the Belly) a very little diſtance from the external Privity, is the neck of the Bladder inſerted; oppoſite to which in its upper ſide it is ſtrongly knit to the Sphincter Muſcle of the Arſe-gut. There is no ſuch neck to diſtinguiſh or ſeparate the Sheath from the bottom of the Womb, as Anatomiſts ſay there is in Women: but the Sheath it ſelf ſeems to be widened into what I call the bottom of the Womb.

The myrtiform Caruncles.

Whether there be any ſuch Membrane that goes croſs the *Vagina* in Mares that have never been cover'd, as Anatomiſts ſay there is in Maids, I never made any carefull examination, but believe there is none. But as for thoſe Caruncles or little kernelly knobs that are called *myrtiformes*, from their reſembling the Berries of the Myrtle in ſhape, they are to be found: yea they may be ſeen without diſſection, if one look near the Privity of a Mare when ſhe is luſtfull and deſires the Horſe; for as ſhe opens the Orifice of the *Vagina*, one may diſcern theſe Caruncles to ſtrut out. They are ſaid to be four in number, the largeſt of which ſtands juſt at the mouth of the Water-paſſage, which it helps, partly, to cloſe up. Their uſe ſeems to be, by their roughneſs and unevenneſs to cauſe the greater pleaſure to the Horſe in Copulation.

The Clitoris.

On the ſame ſide of the *Vagina* with the Bladder is placed a long ſpongie body called *Clitoris*, but lies a great deal farther within the *Vagina* than it is ſaid to doe in Women. For, that end of it which is next to the outward Privity is ſeven or eight fingers breadth from it, whereas in Women it is deſcribed to be within an inch. Thoſe that would make the generative Parts of the Male and Female exactly to reſemble one the other, ſay that this body in the Female, anſwers to the Yard in the Male. And indeed it is of not an unlike ſubſtance, but is not the twentieth part ſo big. It is ſoft and ſpongie, but it is likely when the Mare is luſtfull and deſires the Horſe, it plumps up and ſuffers a ſort of erection, being the principal ſeat of pleaſure in the Mare. It has two pair of Muſcles belonging to it, as well as the Yard of the Horſe. One pair is round, and ſprings from the Hip-bones: The other from the Sphincter of the Arſe-gut. Its *Veins* and *Arteries* ſpring from thoſe that are called *Pudendæ* (or *belonging to the Privity*) and its *Nerves*, (which are pretty large,

to

TAB. IX.

to make it the more ſenſible) ariſe from the ſame origine with thoſe that are diſperſed through the Sheath and Womb.

As to the outward Privity, the *Labia* or *Lips* are the firſt things that offer themſelves. Beſides the common Coverings, to wit the Skin and fleſhy Membrane, they are ſtuft with a little ſpongy Fat. They ſerve to cover the outer orifice of the Sheath for comelineſs ſake, and to defend it from the cold, and Inſects, or other injuries. The cloſing of theſe two makes that which is called the *fiſſure* or chink. If one draw the Lips a little aſide, then appear the *Nymphs*, ſo called becauſe they ſtand next to the Urine as it ſpouts out from the Bladder, and hinder it from wetting the Lips. They are two, on each ſide one, juſt within the Lips, beginning at the jointing or middle of the Share-bone, at the lower ſide of the Privity, from whence they aſcend cloſe by each other to a little above half the breadth of the orifice of the Sheath, and end each in a blunt corner. Their ſubſtance is partly fleſhy and partly membranous; they are ſoft and ſpongie and of a red colour, having the ſame Veſſels with the *Clitoris*. Beſides their uſe to keep off the Piſs from wetting the Lips, they ſerve, as well as the Lips, for cloſing up and covering the mouth of the *Vagina*, at leaſt ſo much of it as they reach unto.

The outward Privity.
The Lips.
The Nymphs.

And now we have done with all the Parts belonging to Generation, both in Male and Female.

Table IX. Repreſenteth the *Cava* and *Aorta*, the Kidneys, &c. and all the Generative parts of a Mare.

A *Sheweth the hollow Vein.*
B *The great Artery.*
CC *The Emulgent Veins.*
DD *The Emulgent Arteries.*
EE *The Kidneys.*
FF *The Deputy-kidneys.*
GG *The Ureters cut off.*
HHH *&c. The Spermatick Veins.*
II *The Spermatick Arteries.*
ii *The Hypogaſtrick Veins.*
ii *The Hypogaſtrick Arteries.*
KK *The Teſticles.*
LL *The Trumpets of the Womb.*
ll *Their jagged Orifices.*
MM *The broad Ligament that ſuſtains them, and alſo connects the Teſticles to the Horns, and both to the Hip-bones.*
NN *The Horns of the Womb.*
OO *The bottom of the Womb where the Foal lies.*
PP *The Sheath of the Womb.*
QQ *The Sheath cut open that the q* Clitoris *may appear.*
R *The Bladder of Urine turned aſide.*
S *Its inſertion into the Sheath near its Orifice.*
TT *The outward Orifice of the Sheath.*

CHAP.

CHAP. XXVIII.

How the Foal is nouriſhed in the Womb; of the Membranes wherein it is wrapt, and the Liquors contained in them; and laſtly of the Navel-ſtring.

HAVING deſcribed all the Parts in Mares that do any ways ſerve for generation, and ſhewn their ſeveral uſes, I ſhould put an end to this Firſt Book, but that it may be convenient to ſpeak ſomewhat of the Young contained in the Womb, for the conceiving and generating of which all theſe Parts were formed. But this I ſhall not do largely in this place, but onely ſummarily and in ſhort, referring the Reader for his fuller information and ſatisfaction to the Treatiſe *of the generation of Animals* annexed to the latter end of this Volume; where by obſerving in what order and by what degrees the conceptions in other Creatures arrive to perfect Animals of their kind, he may by the rule of proportion conceive how they proceed in Mares alſo.

How the Young is nouriſhed.

Now before we come to ſpeak of the Membranes that inveſt the Foal, *&c.* which will be the ſubject of this Chapter, it will be neceſſary to premiſe ſomething concerning the ways or Veſſels by which nouriſhment is conveyed to it, whereby it grows from no bigger than a Bee to ſo vaſt a bulk.

The firſt Opinion.

It is not long ago till when it was the general opinion, that the Young was nouriſhed by the Dam's Bloud; namely, that the hypogaſtrick and ſome of the ſpermatick Veſſels of the Dam did inoſculate with or open into the branches of the umbilical or Navel-veſſels of the Young, and ſo the bloud run from one to the other in a ready courſe. And this Opinion had ſo far prevailed, and was taken for ſo certain a truth, that after the Young was excluded out of the Womb, and muſt needs receive its nouriſhment by the mouth, they believed that it was nouriſhed by Bloud ſtill: For they thought that Milk was firſt Bloud, onely it changed its colour, and its taſte partly, in the white Kernels of the Dugs. This was a ſtrange fancy, that Nature ſhould thus doe and undoe, firſt turn Chyle into Bloud, and then turn that Bloud again into a Liquor reſembling Chyle, and in truth differing very little from it. But this by the way. I ſay, the Dam's Veſſels were ſuppoſed to inoſculate with the Navel-veſſels of the Young; whereby Bloud was carried to it for its nouriſhment: but they never troubled their heads about making it out how the Young ſhould be nouriſhed before it had ever a Navel-veſſel, or before ever the Conception adhered to any part of the Womb. Now the Embryo or firſt draught (as I may call it) of the Young is formed in all Creatures before the Navel-veſſels, and it is grown to a pretty bulk before they are ſo well perfected as to be capable of receiving any Liquor into them. And when they are perfectly formed, and can perform their office, whatever it be; in ſome Creatures, as particularly in a Sow, they never reach further than the *Chorion* or outmoſt Membrane wherein the Pig is included, and therefore have no contact or communication with thoſe of the Sow, whoſe Veins and Arteries reach no further than the inmoſt Membrane of the

the Womb. And in the Creature we have now under conſideration, namely a Mare, it is near ſix months before the *Chorion* adhere to the inmoſt Membrane of the Womb, (which how it does, we ſhall ſhew by and by.) Now theſe obſervations plainly demonſtrate that the Young cannot be nouriſhed by the Bloud of the Dam, ſeeing there is no way whereby the Bloud can be conveyed to it, in any Creature for a conſiderable time, and in ſome Creatures, at all.

The ſecond Opinion.

Others ſufficiently diſcovering the errours of this Opinion, and inclining to believe that the Young in the Womb was nouriſhed with the ſame Liquor while it was there, as it is after it comes into the World, namely Chyle a little refined, and not finding any other convenient ways (as they thought) whereby the Chyle could be conveyed to the Womb, have fancied that they have found Lacteal or Milky-veſſels going thither directly either from the great Kernel at the centre of the Meſentery, or from the common receptacle of the Chyle it ſelf: but others that favour not this Opinion, ſuppoſe thoſe Veſſels that theſe have fancied to be Lacteals, to be onely Lympheducts, conveying the *Lympha* or ſuperfluous Water from the Womb to the common Receptacle, whither the *Lympha* of all the other Parts contained in the Lower Belly is by the ſame Veſſels likewiſe diſcharged. So that though this Opinion be very plauſible for its inventing ſo ready a way for the Chyles coming to the Womb; yet it is very probable that theſe ſuppoſed Milky-veins are nothing but Lympheducts, and then the whole Suppoſition falls to the ground.

The third and trueſt Opinion.

But yet though this ſecond Opinion be miſtaken in the Veſſels that bring the Liquor to the Womb whereby the Young is nouriſhed, yet it ſeems to have hit right on the Liquor it ſelf. For as it cannot be Bloud for the reaſons I have before given, ſo there is no other Liquor in the Body but Chyle, that is capable of being turned into nouriſhment. For though they call that Juice, by which Bodies come to maturity are nouriſhed, (and alſo the Young in the Womb) *nutritious Juice*, yet that name onely denotes its *office*, and does not ſuppoſe that a Liquor quite diſtinct in *nature* from Bloud or Chyle is underſtood by that denomination: but it does indeed partake of the nature both of the Bloud and Chyle; for it is Chyle a little exalted or impregnated with the ſpirit and life of the Bloud. Now this Juice arrives at the Womb by theſe ways. Firſt the Chyle aſcending from the common Receptacle by the thoracick Duct to the right Ventricle of the Heart, it is ſent out from thence together with the Bloud into the Lungs, from whence they both return to the left ventricle of the Heart, out of which they are ejected into the *Aorta* or great Artery, by which means the Chyle runs confounded with the Bloud into all the Parts of the Body; but when the Dam is with Young we may conceive that a greater quantity of it may tend towards the Womb than to other parts: even as it is probable that more wheyiſh or watery Humour accompanies that Bloud that flows by the Emulgent Arteries to the Kidneys, than that which flows to other Parts, becauſe Nature has appointed the Kidneys for the ſeparating of it from the Bloud. I ſay it is alſo likely that more Chyle deſcends to the Womb by the ſpermatick and hypogaſtrick Arteries than to any other part, becauſe a great quantity of it is to be ſeparated from the Bloud here for the nouriſhment of the Young. Now theſe Arteries, as all others in the Body, do divide themſelves ſo often, till they end in very ſmall capillary or hair-like threads, which terminate in the inmoſt Membrane of the

Table X. Shews the *Fœtus* or Young lying covered in the Womb; the Stomach, Guts, *&c.* being removed.

AA *&c. The body of the Matrix.*
BB *The Horn of the Womb on the left ſide.*
DDD *The Liver.*
E *The Bladder.*
FF *The Ligaments of the Bladder.*
GG *The Ureters.*
HH *The Iliack Veſſels.*
II *The Hypogaſtrick Veſſels.*
MM *The Share-bone cut aſunder.*
N *The Privity or* Vulva.
O *The Dock.*
PP *The Midriff.*
Q *The neck of the Bladder joined with the ſheath of the Matrix.*
SS *The Veſſels called* pudendæ, *diſperſed into and about the Lips of the Privity.*

Womb. But all the branches of theſe Arteries about the Womb are much larger when the Female is with Young than at other times, which is an argument that nouriſhment is indeed brought by them. The greateſt difficulty is, how it can be diſcharged out of the Arteries into the Womb, and no Bloud go along with it. To ſolve this difficulty we muſt conſider, that the Particles of ſeveral Liquors are of different figures, as ſuppoſe ſome round, ſome corner'd, *&c.* Now we know that if two bodies of the *ſame* bulk be one round, and another fourſquare, the round will go through a hole which the fourſquare body will not, and on the contrary the fourſquare body will paſs through a hole that the round will not; accordingly as the hole is round or fourſquare. And this may be the reaſon that the Chyle can paſs out of the ſmall ends of the Arteries, and yet the Bloud cannot accompany it, but muſt return back by the Veins. And beſides the difference of figure, it is probable the Particles of that Chyle that ouzes into the Womb, are of much *ſmaller* bulk than thoſe of the Bloud, ſeeing it is a much thinner and watery body; and therefore may as eaſily be ſeparated from the Bloud into the Womb, as the Urine is by the Kidneys into the Ureters. And to further and aſſiſt this ſeparation ſome do believe there is a certain fermentation in the Womb, even as there is in other Parts of the Body, where other Juices are ſeparated from the Bloud, as Choler in the Liver, and according to ſome, Urine in the Kidneys. But be the ſeparation by what means it will, that there is ſuch a thing is moſt certain, and how the Young comes to partake of it for its nouriſhment we ſhall next ſhew.

The Membranes that the Foal is wrapt in.

While it was believed that a Conception was made of the Male and Female's Seed mixed together, it was ſomewhat difficult to imagine how ſuch a fluid ſubſtance ſhould ſo ſpeedily acquire ſo compact Membranes to include it, as we ſee it has in a few days. But now that it is believed that a Conception is nothing elſe but an Egg dropt off from the Teſticle and received into the Womb, that difficulty vaniſhes, for thoſe Membranes do originally inveſt the Egg, even as we ſee the like Membranes lie under the ſhells of the Eggs of Fowls, and encompaſſing the whole. Theſe Membranes are at the firſt but two, called *Amnios* and *Chorion*; but after a while there is a third commonly called *Allantoides*, or the Pudding-like Membrane.

That

TAB. X.

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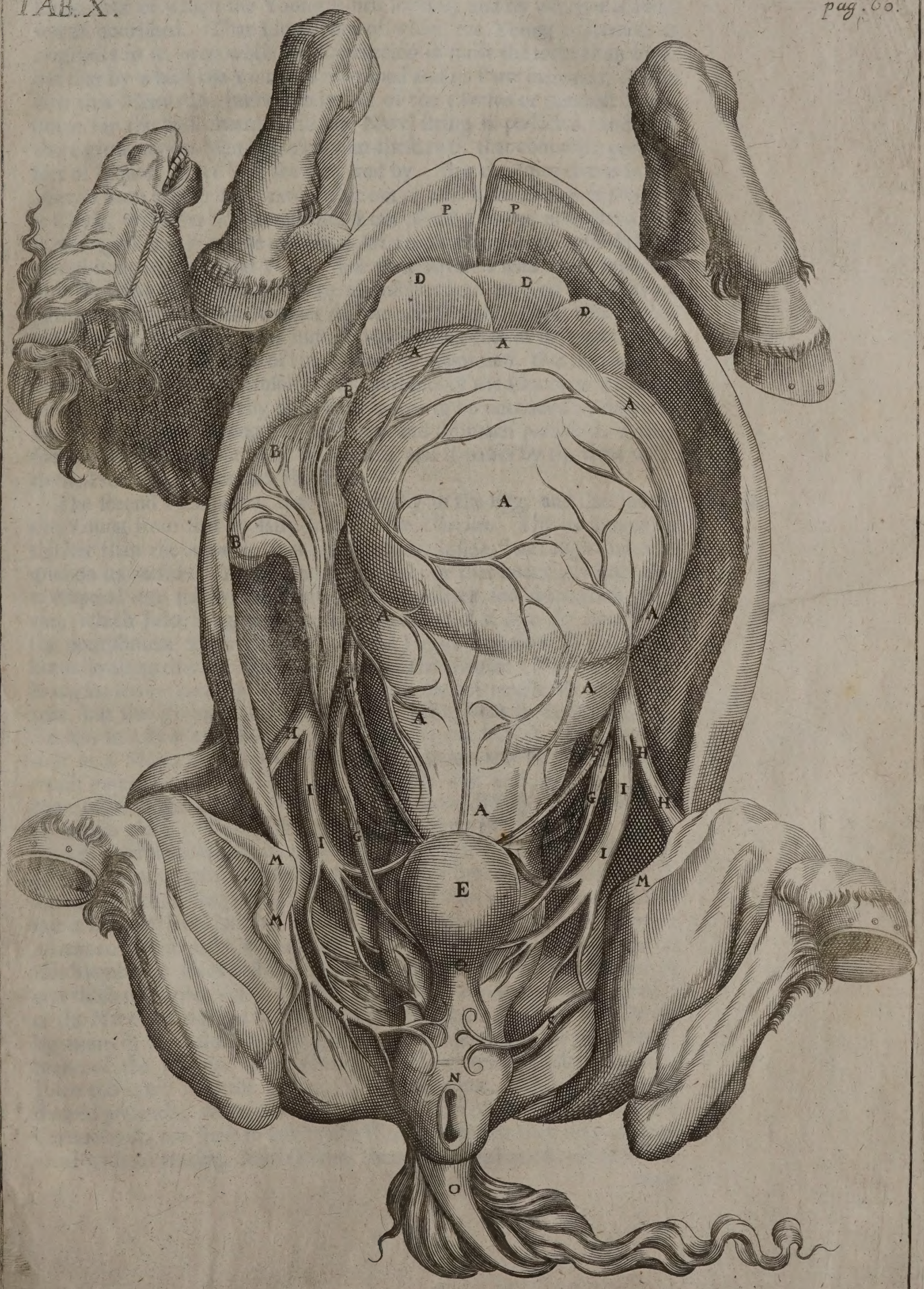


That Membrane or Skin that immediately infolds the Young is called *Amnios*. It is very thin, ſmooth and clear, and in it is contained that Liquor out of which the Young is firſt formed, and by which it is afterwards nouriſhed. That Liquor out of which the Young is formed, is originally in it, even while the Conception is under the form of an Egg: but that by which the Young is nouriſhed and its Parts increaſed, ſweats into this Membrane immediately out of the *Chorion* or outmoſt Membrane for the firſt months, till the Navel-ſtring is perfected, and that there grows a new Membrane betwixt theſe two, that contains a peculiar ſort of Liquor, as we ſhall ſhew by and by. But the Juice that is in the *Amnios* from firſt to laſt (except that out of which the *Embryo* is *formed*) is Chyle, which at firſt ſweats into it out of the *Chorion*, and afterwards is conveyed into it by the umbilical Arteries of the Young, who firſt received it by its umbilical Veins. For theſe Arteries ſend many branches into the *Amnios*, which diſcharge themſelves into it, even as the hypogaſtrick and ſpermatick Arteries do into the Womb. Now this Liquor that is thus collected in this inmoſt Membrane, does at firſt nouriſh the *Embryo* or firſt rudiments of the Young by appoſition, that is, thoſe rudiments do attract to themſelves ſuch particles of the Liquor as are ſuitable for them, and thereby their bulk comes to be encreaſed by degrees: but as ſoon as the Young has its Mouth and Stomach perfected, it then ſucks it up and drinks it in by its Mouth, and it paſſes by the ſame ways to the Heart as it does after the birth. *The* Amnios.

The ſecond Membrane, that is originally in the Egg, and that inveſts the Young from firſt to laſt, is called the *Chorion*. This is ſomewhat thicker than the *Amnios*; it is ſmooth on its inſide, but rough and unequal on its outſide. This Membrane drinks up that nutritious Juice that is emptied into the Womb from the hypogaſtrick and ſpermatick Arteries, which Juice is again filtred as it were out of it into the *Amnios* for the nouriſhment of the Young. For the Liquor contained in this Membrane is altogether the ſame with that of the *Amnios*. Now this Membrane for ſeveral months (five or ſix) adheres not to the Womb in any part, but the Young that is clad with it, lies as looſe in the Womb, as a Bladder in a Foot-ball that is not at all tied to the leather. (Thus I ſay it is in a Mare, though in moſt other Creatures this Membrane begin much ſooner to be faſten'd to the Womb.) But at length firſt of all there begin to grow in the ſurface of it certain reddiſh ſpecks or caruncles no bigger than a Vetch, and at the ſame time the Membrane grows thicker, and there appear innumerable Veſſels in it. And theſe Caruncles as they become more in number, ſo they grow broader in dimenſion, inſomuch as at laſt they are ſpread all over the *Chorion*, ſo that on its outſide it ſeems to have loſt the nature of a Membrane, and to have become a *placenta* or Womb-cake. At the ſame time that theſe Caruncles grow thus on this Membrane, the Navel-ſtring penetrating the *Amnios* is inſerted into it, and thoſe numerous Veſſels that are ſeen in the *Chorion*, are onely branches of the Navel-arteries and Veins diſperſed through it. And now the *Chorion* by means of the Caruncles that grow upon it, adheres to the inner Membrane of the Womb, from whence the Navel-veins imbibe nutritious Juice and carry it to the Young for its ſuſtenance, (as ſhall be further ſhewed preſently, when we come to ſpeak of the Navel-ſtring.) But the Caruncles do not ſtick ſo faſt to the Womb, but that they may be ſeparated without tearing, much leſs are there any Anaſtomoſes or Inoſcula- *The* Chorion.

tions of the Veſſels that run through the *Chorion* with the hypogaſtrick or ſpermatick Veſſels of the Dam, as the Ancients believed. Nor is there in a Mare any of thoſe Glandules that are commonly called *Cotyledons* or Sawcers, ſticking to the inner Membrane of the Womb, into which the Caruncles of the *Chorion* are inſerted, like an Acorn into its cup, ſuch as are in Sheep and Goats: but the ſo often mentioned Caruncles ſtick immediately to the Membrane it ſelf, and ſeem to ſerve as Sponges to imbibe the nutritious Juice that plentifully bedews it; which having done, the ſaid Juice is ſuckt up by the mouths of the Navel-vein, as was ſaid before. Part of this Membrane does on each ſide bag out into the Horns of the Womb.

Allantoides. As ſoon as the Navel-ſtring has penetrated the *Amnios*, there begins to appear a third Membrane betwixt theſe two already deſcribed, which contains a Liquor wholly different from what ſwims in *them*; for *that* we have ſhewn to be *Chyle*, but *this* is the *Urine* of the Young, which, while the Young is in the Womb, is not emptied out of the Bladder the common way, but there is a Pipe called *Urachus* that paſſes from the bottom of the Bladder out at its Navel, and empties the Urine into this Membrane, in which it is collected to the quantity of many quarts. This Membrane is called *Allantoides* or Pudding-like, becauſe in many Creatures, as Cows, Sheep, *&c.* it is of that ſhape, and ſeems to be onely the *Urachus* a little widened. But it is of another figure in Mares (as it is alſo in Women) and is of the ſame dimenſion with the other two already deſcribed, incompaſſing the whole Young. It is more denſe than they, and may be eaſily diſtinguiſhed from them by this, that *they* are full of Veſſels, but *this* has not one, that one can diſcern. Although this Membrane appear not till the time aforeſaid, yet 'tis like it was originally in the Egg; and at its appearance the *Chorion* becomes empty, becauſe there is now no longer paſſage of any thing out of the *Chorion* into the *Amnios*, by reaſon of this Membrane and its Liquor interpoſing. Whence the *Chorion* claps pretty cloſe to the *Allantoides*, ſo that they cannot be eaſily ſeparated. In the Liquor contained in the *Allantoides* there ſwim ſeveral gobbets that look like as if they were fleſhy, but being pulled to pieces they appear skinny. They are ſuppoſed to be concretions of ſome part of the nutritious Juice that may come along with the Urine into this Membrane, wherein by its long ſtay it curdles into theſe kind of bodies. But there is one more notable one, that is ſaid to grow on the Forehead of the Colt, of the ſhape of a Tongue, and is called *hippomanes*, which, Tradition ſays, the Mare is wont to eat as ſoon as ſhe has foal'd; which if ſhe do not, ſhe will never care for her Foal. This they were wont to dry and powder, and to put into drink for a Love-potion, as if there were ſome witchery in it. But ſuch things I can ſay nothing to, having never experimented them. This Membrane ſticking pretty cloſe to the *Chorion*, bags out on each ſide into the Horns of the Womb as well as it. The Liquor contained in it, is Urine, as was ſaid above, which daily increaſes in quantity, being imported into it by the *Urachus* from the Bladder of the Foal.

Table

TAB. XI.

pag. 63.

Table XI. Shews the Belly of the *Fœtus* opened, the better to ſhew the Umbilical Veſſels; as alſo two of the Membranes laid open, in which the *Fœtus* is included in the Womb, with the Veins and Arteries branching into them.

AA *The Liver.*
B *The* Sternum *or Breaſt-bone.*
CCC *The Gut* Colon.
D *The Bladder of Urine.*
E *The* Urachus *cut off ſhort, becauſe the* Allantoides, *into which it is inſerted, is not expreſſed.*
FF *The Umbilical Vein.*
GG *The Umbilical Arteries.*
HHH *&c. The Membrane* Amnios.
II *&c. The Membrane called* Chorion, *with the branches of the Umbilical Veins and Arteries diſperſed through it.*
MM *&c. The like branches running through the* Amnios.
S *The Caruncle called* Hippomanes, *which is ſaid to grow on the Foal's Forehead, but is indeed found in the middle Membrane called* Allantoides.

Laſtly, We are come to the Veſſels that make up the Navel-ſtring, and thoſe are four, one Vein, two Arteries, and the *Urachus*. Theſe are all infolded in a common Coat, and are wreathed one about another like a Rope. The greateſt part of its length is contained in the *Amnios*, the reſt in the *Allantoides*; for as ſoon as it has penetrated that, it is immediately and directly implanted into the *Chorion*. *The Navel-veſſels.*

The *Vein* is as big as both the Arteries, and ariſes out of the hollow or lower ſide of the Liver of the Young, and coming out ſingle with the reſt at the Navel, is immediately divided into two, which as they paſs through the *Amnios*, ſend ſome twigs to it, and from thence continue their march through the *Allantoides* to the *Chorion*, in which and the Caruncles that grow upon it they terminate, being divided into innumerable branches. Its uſe is to imbibe the nutritious Juice and alſo the Bloud that is ſuperfluous to the nouriſhing of theſe Parts, and to convey them to the Young. *One Vein.*

The *Arteries* being two, do ariſe on each ſide from the inner Iliacal Branches of the great Artery, (as is commonly held, but I have always obſerved them to ſpring from the *Aorta* it ſelf before the diviſion) and aſcending by the ſides of the Bladder, they meet the Vein at the Navel, and there begin to be wreathed with it. Their march and inſertions are the ſame with thoſe of the Vein, onely they ſend more twigs into the *Amnios* than the Vein doth. Their uſe is to carry vital heat and nouriſhment to the Parts that include the Young, to wit to the *Amnios*, *Chorion* and its Caruncles: and beſides, its branches that are diſperſed through the *Amnios* do diſtill into it ſome of that nutritious Juice which could not be turned into Bloud by once circulating through the Heart of the Young. Which Juice being collected in the cavity of the *Amnios*, is drunk in by the Young at its mouth, and ſo paſſes the ſame ways as it does after the birth. *Two Arteries.*

The

The Urachus.

The fourth Veſſel included in the Navel-rope is called *Urachus*, from its office of conveying the Urine. It ſprings from the bottom of the Bladder, and paſſing out of the Navel with the Vein and Arteries, as ſoon as it has pierced the *Amnios* it opens it ſelf with a full mouth into the cavity of the *Allantoides*, ſerving as a Pipe to rack the Urine as it were out of the Bladder of the Young into this Membrane. For though the Young void no Excrements at the Fundament, while it is in the Womb, nor has any Repoſitory or Storehouſe for them ſaving its own Guts, (amongſt which the Gut *Cæcum* ſeems fitteſt for that office:) yet ſeeing it is nouriſhed altogether with Liquor that has a good quantity of wheyiſh humour mixed with it for its better conveyance through thoſe narrow ways by which it is to paſs, I ſay for this reaſon it is neceſſary there ſhould be ſome particular Repoſitory for it, ſeeing it cannot return to the Dam again, and the Bladder of the Young is not capable of containing a fifth (may be a tenth) part of it; and this Repoſitory is the Membrane *Allantoides*, into which it is poured out of the Bladder by the *Urachus*.

Theſe four Veſſels after they come out of the Navel are included in one common Coat, which conſiſts of a double Membrane, borrowed from the Rim of the Belly the inner of them, and the outer from the fleſhy Membrane or Pannicle deſcribed above *chap.* 4. After the birth of the Foal, theſe Veſſels loſing their original uſe, the two Arteries ſerve for Ligaments to keep the Bladder in its place, and the Vein performs the ſame office to the Liver; but the *Urachus* quite diſappears.

And thus much of the Membranes and Navel-veſſels, that are included in the Womb when the Mare is with Foal; and which at the Foaling make the After-birth or Cleaning as we call it: We might in this place further ſhew, what Parts of the Foal are firſt formed, and which ſooneſt perfected, alſo in what particulars a Foal in the Womb differs from it ſelf when foaled; and laſtly we might have been more full in ſhewing how it is nouriſhed in the Womb: but the diſcourſing of theſe things we purpoſely wave in this place, and refer the Reader to the Diſcourſe *of the generation of Animals* annexed to this Treatiſe of Anatomy, wherein we will endeavour to ſatisfy his curioſity to the uttermoſt.

Table XII. Shews the Foal taken out of the Matrix, both wrapt in the Membranes with which it was covered, and alſo quite cleared of them; and laſtly, the ſaid Membranes cut open, the Foal as yet remaining in them.

Fig. I. Shews the *Fœtus* taken out of the Matrix, remaining in the ſame poſture as in the Womb, and wrapt in its Membranes.

AA *The Membranes.*
CC *The hinder Legs of the Foal.*

Fig. II. Shews the *Fœtus* cleared of the Membranes, but continuing in the ſame poſture.

BBB *The Body of the Foal.*
SS *The common covering of the Umbilical Veſſels turned back, that the four Veſſels contained in it may appear.*
TT *The Umbilical Arteries.*

Fig. 1.

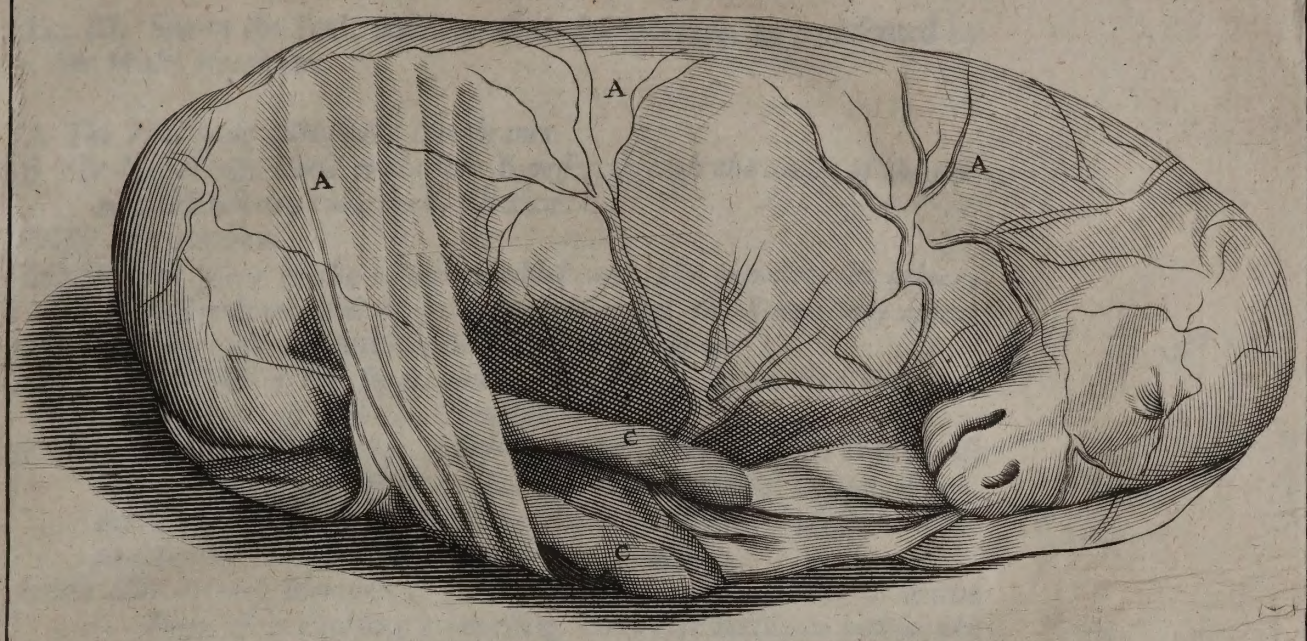
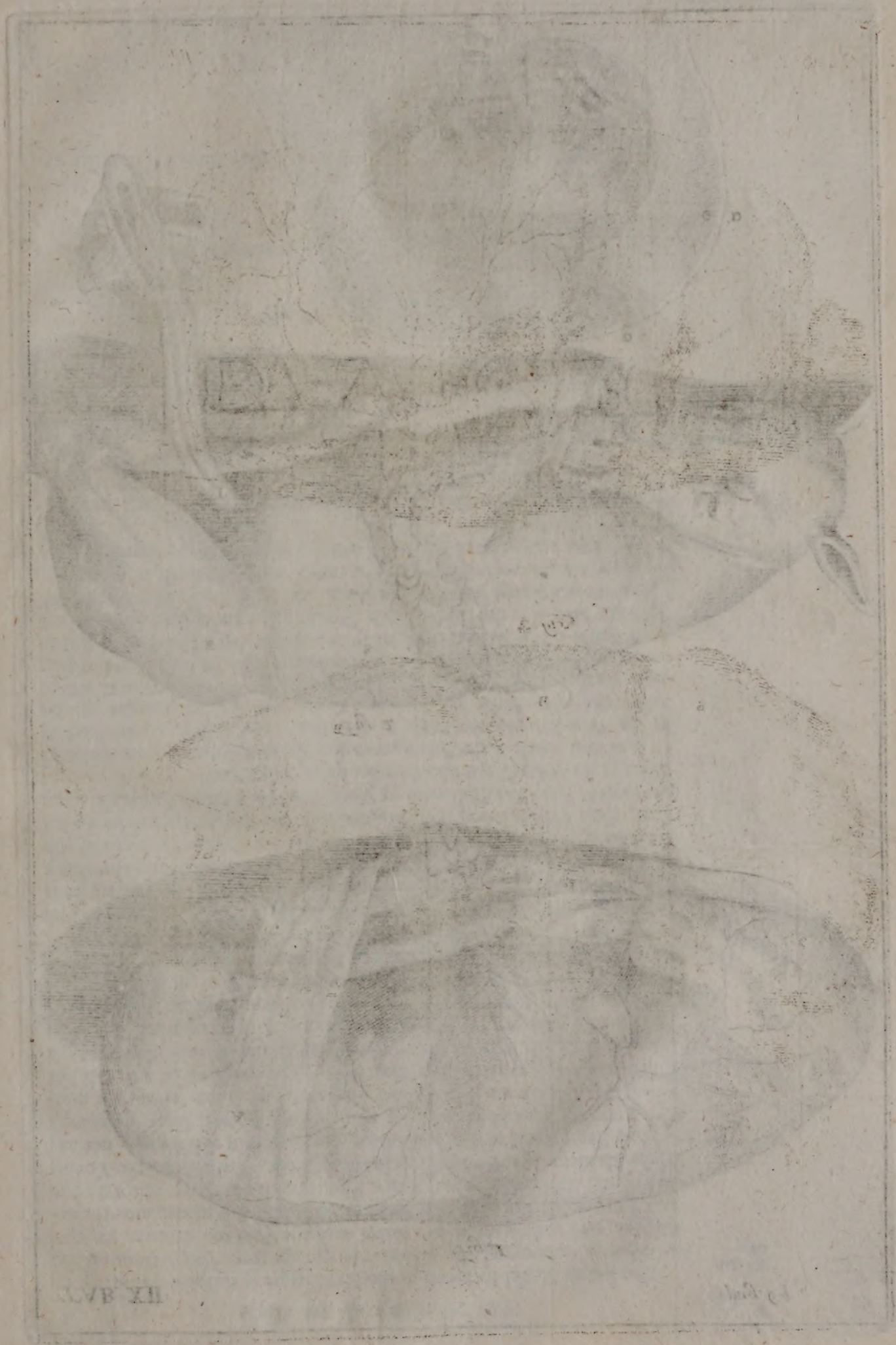


Fig. 2.

Fig. 3.



U *The Umbilical Vein.*
X *The* Urachus.

Fig. III. Shews the Foal, and two of its Membranes, as repreſented by Dr. *Walt. Needham.*

A *The Foal lying within the Membranes.*
B *The Navel-rope whoſe production* E *paſſes through the cavity of the urinary Membrane toward the* Chorion.
CCC *The* Amnios.
DDDD *The place of the* Chorion *which naturally grows to the urinary Membrane, but is here removed, that the* Fœtus *may appear through the* Amnios *and urinary Membrane.*
E *The production of the Rope which at this place is divided into two, and ſo is cut off with the* Chorion.
F *The place in the Navel-rope, where the exit of the* Urachus *is deſign'd, between two blots. Which* Urachus *is not indeed a part of the Membrane* GG *or Urinary, but of* CC *or* Amnios, *and ſeems a duplicature of it turned back even to the Bladder.*
GGG *The urinary Membrane, (which here is not* Allantoides, *or of the ſhape of a Pudding) inveſting the whole* Fœtus *as well as the* Amnios; *which is common to it with a Man, Dog, Cat, Coney, and perhaps others that have Womb-cakes; although they differ from one another in ſeveral circumſtances.*
HH *The progreſs of this Membrane as alſo of the* Chorion *into the Horns of the Womb. Whereas all the whole* Fœtus *beſides, &c. lies in the bottom of the Womb, as a Child does in a Woman's.*
aaaa *The Bloud-veſſels diſperſed from the Rope into the* Amnios, *which the urinary Membrane wants wholly; for the reſt of the Rope is all ſpent on the* Chorion, *and is cut off with it.*

CHAP.

CHAP. XXIX.

Of the Udder.

THOUGH the Udder be an *external* Part of the Lower Belly, yet we have deferr'd the deſcription of it till this place, becauſe of the dependance that it has upon the Womb, and its office of yielding the ſame nouriſhment to the Foal when it is excluded out of the Womb, as it was nouriſh'd by while it remain'd in it.

It is ſeated at the bottom of the Paunch upon the lower ends of the ſtreight Muſcles; very ſmall, if compar'd to the bigneſs of a Mare's Body, and to its bulk in many other Creatures. When the Mare gives no ſuck, it almoſt diſappears.

Its ſubſtance. It conſiſts of the common coverings, Fat, a multitude of Veſſels, Glands or Kernels, and Pipes to convey the Milk to the Paps that is ſeparated from the Veſſels in the Glands.

Number. Now though when the Mare gives ſuck it ſeems to be but *one* roundiſh body, like a Breaſt with two Nipples, yet it truly conſiſts of *two* bodies, one being joined to the other onely by contiguity, for they have each their proper Veſſels, Pipes and Pap; and do indeed appear to the eye to be diſtinct when the Mare is neither with Foal nor ſuckles one.

Its Glands. The greateſt part of its bulk conſiſts of *Glands*, which are many in number, though they be ſo united to one another as to appear one continued body to an unwary obſerver, which they come to do from that Fat that fills up the ſpaces between them, and is much of the ſame colour with the Glands. There is one Gland greater than the reſt ſeated at the root of each Pap. By means of theſe Glands it is that the Milk is ſeparated from the Bloud, as ſhall be further ſhewn by and by.

The Paps. The *Paps* are round in ſhape and of a ſpongie ſubſtance, cloathed with a thinner Skin than the reſt of the Udder. At their head or end they have many little holes through which the Milk iſſues when the Foal ſucks.

The Veſſels belonging to the Udder. The Udder has all ſorts of *Veſſels*, Veins, Arteries, Nerves and Lympheducts; and beſides theſe it has peculiar Pipes for containing and conveying the Milk. The *Veins* and *Arteries* are branches of the *Hypogaſtricks*, which proceed from the *internal* Iliack branches of the *Cava* and *Aorta*: 'tis likely there come ſome twigs to it alſo from the *external* branches, which are called the *Epigaſtrick* Veſſels. Its *Nerves* I have not examin'd, but 'tis very probable they are the ſame with thoſe diſperſed into the Matrix and Sheath, which are twigs of the Intercoſtal pair and of ſome of the *Os ſacrum*. Its *Lympheducts* are pretty numerous, and tend, as all thoſe of the Lower Belly do, to the common Receptacle of the Chyle at the centre of the Meſentery.

The milk-pipes. It has alſo a peculiar ſort of Veſſels, which may be called *Milk-pipes*, being the Repoſitories or Store-houſes of the Milk. At the root of each Pap they are but one on each ſide, but a great many ſmaller ones coming from every part of the Udder diſcharge themſelves into this one, when the Pap is ſuckt by the Foal. But the Pipes belonging to one Pap have no communication with thoſe that belong to the other, but in reſpect of theſe

theſe Veſſels the two ſides of the Udder are as diſtinct Parts, as the Breaſts of a Woman are diſtinct one from another, as was noted before. Theſe Pipes have been miſtaken by ſome to be true Milky-veins, as if ſome of the Milky-veins of the Meſentery reached hither. But ſeeing there are no footſteps of them in the track betwixt the Meſentery and Udder, we may well deny them to be found in the Udder it ſelf.

The uſe of the Udder.

The *uſe* of the Udder is to prepare and ſeparate the Milk for the nouriſhment of the Foal, which it does in this manner. The Chyle of the Mare being mixed with her Bloud in the Heart, flows from thence along with it by the Arteries into all Parts of the Body in the circulation, but moſt plentifully ('tis probable) towards the Udder, even as it does to the Womb while the Mare is with Foal. The Arteries that convey it immediately to the Udder are the hypogaſtrick Branches, which terminating in its Glands do ſquirt or ſtrain the Chyle through them into the Milk-pipes. And as for the Bloud that was mixed with the Chyle in the Arteries, that being of a thicker body, or conſiſting of Particles of another form, cannot enter the narrow pores of the Glands, and therefore is received by the ſmall mouths of the Veins that are likewiſe inſerted into them. So that it appears to be an erroneous Opinion, That Milk is made of Bloud, if we ſpeak of Bloud properly ſo called; yet ſeeing the Chyle, when it is confuſedly jumbled with the Bloud in the Arteries, is not eaſily diſtinguiſhable from it, but the whole Maſs ſeems to be homogeneal or of the ſame nature, in a large and leſs proper ſenſe we may affirm it to be ſo made. After that the Chyle is thus ſeparated by the Glands, it drills along the Milk-pipes, out of the ſmaller into the larger, in which it is reſerved for the uſe of the Foal.

The End of the Firſt Book.

THE ANATOMY OF AN HORSE.

BOOK II.

Of the Middle Venter, *or Cheſt.*

CHAP. I.

Of the inveſting and circumſcribing Parts of the Cheſt.

HAVING finiſhed the Firſt Book, wherein I have abſolved or explained all the *Natural* Parts contained within the Lower *Venter*, as well nutritive as generative, and annexed a Diſcourſe of the Foal in the Matrix or Womb; order of diſſection requires that in the next place I come to treat of the Middle *Venter*, the *Thorax* or Cheſt, and the *Vital* Parts contained therein.

Where, in this one ſtep higher that I have climbed, I am methinks much delighted to ſee, how Nature in this place diſports her ſelf, having as in a curious Cabinet lockt up, as it were, her moſt exquiſite pieces of Workmanſhip, the *Vital* Inſtruments, by whoſe motion the life of the Creature is continued. Which motion is performed by ſo juſt a counterpoiſe, as no art of Man could ever with all their contrivances be able in the leaſt to imitate. Nay *Ariſtotle*, that wiſe Philoſopher, who was in his time thought to be the neareſt of counſel to Nature, was not able

(notwithſtanding his incomparable ſagacity) to find out the true cauſe of the Vital motion, any more than he was, to find out the reciprocal Ebbing and Flowing of the Sea.

The Place wherein theſe Inſtruments are contained, is called the *Thorax* or Cheſt, which is compoſed of or environed with theſe Parts following.

By what parts the Thorax *is bounded.*

Firſt it is bounded or circumſcribed, above, by the Coller-bones, and below by the *Diaphragm* or Midriff; on the fore-part by the Breaſt-bone, and on the hinder part by the Spondyls or Back-bones; and on the two ſides by the true and baſtard Ribs and Intercoſtal Muſcles. All which Parts are framed and compoſed by Nature for the benefit of the Creature, as well for the *defence* of the contained Parts from external Injuries, as for the uſe of *Reſpiration* or breathing: both which are very needfull; for without them the Creature cannot be preſerved. Now that it might ſerve for theſe ends, it was neceſſary it ſhould conſiſt of ſundry Parts; for ſhould it have been made all bony, it could not have been contracted and dilated as occaſion ſerved, whereby the Lungs could not have had the liberty to play as now they have: And if it had been wholly fleſhy, then would not the contained Parts have been ſufficiently fenced. It is therefore made partly bony, partly griſtly, and partly fleſhy, that it might the better perform both the offices aforeſaid.

In the next place I come to ſpeak particularly to the *Inveſting* Parts of the Cheſt, ſome of which are *Common*, and others *Proper*.

Its common inveſting Parts.

The *Common inveſting* or *containing* Parts are the ſame as the Lower Belly hath, namely the Scarf-skin, the true Skin, the fleſhy Pannicle, the Fat, and the common Membrane of the Muſcles. Of all which having diſcourſed at large in the Firſt Book, we ſhall ſay nothing of them here.

Its proper containing Parts.

The *Proper containing* Parts of the Cheſt are the Muſcles, the Bones, the *Pleura* or Membrane that cloaths its inſide, the Midriff and the *Mediaſtinum*, which is the Skin that goes acroſs from the Breaſt to the Back, and parts the Lungs, called by ſome, the Partition-wall.

Its contained Parts.

The *contained* or *inveſted* Parts, are the Heart with the Heart-bag called the *Pericardium*, and by ſome the Purſe of the Heart, the Lungs and part of the Weazand or Wind-pipe, by Anatomiſts called *Aſpera Arteria*, or Rough-artery, and ſeveral Veſſels, with the Trunks of *Vena cava* and *Arteria magna*, whoſe aſcending branches are underpropped by the *Thymus*, or Kernel in the Throat.

H

CHAP.

CHAP. II.

Of the Muſcles of the Middle Venter *or Cheſt, called the Intercoſtal Muſcles.*

THERE are ſeveral pairs of *Muſcles* that lie upon the Cheſt on the outſide of the Ribs; but becauſe one may eaſily enough cut open the Cheſt for examining the Parts contained in it, without defacing any part of thoſe Muſcles, we ſhall omit to ſpeak of them in this place, referring the Reader to the Book of the Muſcles; and here onely deſcribe the *Intercoſtal*, which in laying open the Breaſt, whiles one breaks the griſtly ends of the Ribs, happen part of them to be defaced.

Theſe Muſcles are called *Intercoſtal* from their being placed *between the Ribs*, and filling up the ſpaces between them. Betwixt every two Ribs there are placed two of theſe Muſcles, the one lying upon the other; the uppermoſt being called the *External*, and the undermoſt the *Internal one.* *Intercoſtal Muſcles why ſo called.*

The *External* one takes his riſe from the lower part of the upper Ribs, and ends in the upper part of the lower. *The External.*

The *Internal* takes his riſe contrary to the former; for it ariſes or takes its original from the upper part of the lower Rib, and ends in the lower part of the upper. *The Internal.*

Now it is to be underſtood that thoſe are called the upper Ribs that are next to the Head, and thoſe the lower, that are next to the Paunch.

And as theſe Muſcles do differ as to their original and inſertion, ſo likewiſe in the courſe of their Fibres; for although they be both furniſhed with oblique or ſlanting Fibres, yet they run contrary ways, croſſing one the other, and making as it were a St. *Andrew*'s Croſs, or the letter X.

Theſe Muſcles are in number ſixty four, that is to ſay on each ſide thirty two, there being on each ſide of the Horſe ſeventeen Ribs, and between every Rib two Muſcles, as I have before intimated. *Their number.*

Now the *action* of theſe Muſcles is to aſſiſt Reſpiration by widening, and contracting the Cheſt. Firſt the *external* ones ſerve to raiſe the Ribs and draw them backward, whereby the Cavity of the Cheſt is enlarged, and thereby free room made for the Air to enter into the Lungs in *Inſpiration*, or taking in the breath. And on the contrary the *internal* pull in the Ribs by drawing them ſlanting downwards towards the Breaſt-bone, whereby the Cheſt is ſtraitned, and thereby the Air, wherewith the Lungs are puff'd up, expelled, which action is called *Expiration*, or breathing forth. But theſe Muſcles are not of themſelves alone ſufficient for theſe actions, but they aſſiſt towards them, being aided by the other that lie upon the Cheſt, by the Midriff, and by the Lungs themſelves. *Their action.*

CHAP.

CHAP. III.

Of the Pleura, *or Coat which inveſts or lines the Ribs on the Inſide.*

THIS Coat or Skin called the *Pleura*, is the Skin which covereth all the Ribs on the inſide of the Cheſt, being of the ſame nature and uſe here, as the *Peritonæum* or Rim of the Belly is in the Lower Belly. It is alſo of the ſame ſubſtance as the Rim of the Belly is, but much ſtronger and thicker, though *Riolanus* affirmeth the contrary as to Men.

It is as it were of a middle nature or temper, that is, neither too hard nor too ſoft; not too hard, leſt it ſhould not reach and yield in the act of Reſpiration, and ſo hinder the motion of the Cheſt; neither too ſoft, leſt the motion of the Cheſt ſhould violate it: but it is rather hard than ſoft, the better to defend the Vital Parts.

The original of the Pleura *or Rib-skin.*

It is believed to take its *original* from the Coats of the Nerves of the Spinal Marrow, which come out of the Back-bones (or *vertebræ* of the Back) into the Cheſt, and is therefore thought to be continued with the Coats of the Brain: wherefore it is obſerved to be thicker upon the back part of the Cheſt than any where elſe, where it ſticks ſo cloſe to the Back-bones, that it can hardly be ſeparated.

It is all over double, that the Intercoſtal-veſſels might run without danger between its Membranes, and by it be preſerved from the hardneſs of the Ribs, which would be apt to violate or break them.

The outward Skin of this Coat, namely that which is next to the Cavity of the Cheſt, is harder and thicker; and the inward (which is faſtned to the Ribs) is ſofter and thinner. Now between theſe two Skins is bred that mortal Diſeaſe (in Men) called the Pleuriſie, by which the never to be forgotten Doctor *Willis*, (for being in his time the honour of his Univerſity and Country) was notwithſtanding the great pains he took in the inquiry into and finding out remedies againſt this Diſeaſe, (as his learned Works make appear, by which great benefit hath accrued to others) was, I ſay, himſelf by the tyranny of it taken from amongſt the Living.

Its Perforations.

This *Pleura* is perforated in many places, for the Ingate and Outgate of the Veſſels. For above, it letteth out the Jugular and Axillary Arteries and Veins, and below, through the Midriff, the Trunks of the hollow Vein and great Artery. Beſides where it receiveth in the Nerves of the wandring pair, the Windpipe, and both letteth in and out the Gullet.

Its Veſſels.

Its proper *Veſſels* are, *Veins* from the *Vena ſine pari*, or Vein without a pair, and from the upper Intercoſtal Vein. Its *Arteries* ſpring alſo from the upper Intercoſtals (as thoſe from the Subclavian) which deſcend to about the ſeventh or eighth Rib: below which it receives twigs of Arteries from the back part of the deſcending great Artery. It has as many pairs of *Nerves* (wanting one) as there are Joints in the Back-bone the whole length of the Cheſt: for betwixt each Joint there comes out a pair; but then the uppermoſt and loweſt Joints being reckoned for the

the two extremes, (and not a pair of Nerves for either extreme) there muſt be one pair of Nerves leſs than there are Joints. The Joints therefore (or *vertebræ*) being ſeventeen, there muſt onely ſixteen pair of Nerves be reckoned to the Cheſt. Now theſe Nerves as ſoon as ever they come out of the Joint, are immediately divided into the *fore* and *hinder-branches*. Of which the *fore-branches* ſerve the Intercoſtal Muſcles and the *Pleura*; but the *hinder* are beſtowed on the Muſcles that lie upon the Back.

The *uſe* of it is much like that of the Rim of the Belly; for (as hath been ſaid) as the Rim of the Belly is ſtretched about all the Lower Belly, and furniſheth all the Bowels therein contained with Coats or Skins, (every Bowel with a particular Coat) ſo doth this *Pleura* the Bowels of the Middle *Venter*: for it is ſtretched about all the Cavity of the Cheſt, and giveth a Coat to every particular Part therein contained, (either mediately or immediately.) It covers alſo the Intercoſtal Muſcles, and makes the upper Membrane of the Midriff. Next to the Cavity of the Cheſt it is bedewed with a watery humour, that the Lungs which lie againſt it on their outſide, may move the more glibly, and not be offended by its roughneſs. *Its uſe.*

CHAP. IV.

Of the Midriff or Diaphragm.

THE *Diaphragm* (or *Midriff*) is ſo called from its office of diſtinguiſhing or ſeparating; becauſe it ſeparateth or diſtinguiſheth the Bowels of the *lower*, from the Inſtruments of Life and Reſpiration in the *middle* Belly. *The Diaphragm why ſo called.*

It is a Muſcle, long and round, ſeated at the lower part of the Cheſt, overthwart which it runs, ſloping a little lower towards the Paunch backward. It hath a figure and action different from all other Muſcles.

It is as broad as the Cheſt is wide: for its edges are knit to the lower part of the Breaſt-bone, and all round on each ſide to the Ribs, and to the loweſt vertebral Joint of the Cheſt.

It is ſaid to ariſe from its two long and fleſhy Productions, which ſpringing from the *vertebræ* of the Loins (to the muſcles whereof they are ſtrongly knit) do, as they go upwards, grow wider and wider, till they come to the loweſt *vertebræ* of the Cheſt, where they grow and unite together, and ſo ſpread themſelves into this Muſcle called the Midriff. Others, though they grant that theſe are part of its original, yet think that it does equally ariſe from its whole fleſhy circumference, by which it adheres to the ends of the loweſt Ribs. And a third opinion is, that its original is from its centre or middle where its Nerve is inſerted into it, from that common Maxim of *Galen*'s, That whereever the Nerve is inſerted, *there* is the head of the Muſcle. But as that Maxim does not hold in *all other* Muſcles, ſo *this* being a Muſcle of a peculiar ſhape and uſe, it may well be excepted therefrom, eſpecially ſeeing the centre of the Midriff is tendinous, *Its riſe.*

tendinous, which the origine of a Muſcle does not uſe to be, but onely its end.

Its ſubſtance. As for its *ſubſtance*, it is partly fleſhy, partly nervous and partly membranous. For Membranes, becauſe it requireth great ſtrength (it being in continual motion) it is furniſhed with two, and thoſe very ſtrong ones, the uppermoſt of which it hath from the *Pleura*, and the lowermoſt from the *Peritonæum* or Rim of the Belly. To the uppermoſt the lower part of the *Mediaſtinum* is knit, (and of the Heart-bag in Men, but not in Horſes or other Brutes) and ſometimes the lower tips or ends of the two great Lobes of the Lungs. Its circumference is fleſhy, and its middle or centre nervous, in which part a wound is mortal, but one in the fleſhy ſometimes admits of cure.

Its Perforations. It hath in it ſeveral *perforations* or *holes*, ſome of which are little, and others bigger. The little ones are the *pores*, through which the Vapours are ſaid to aſcend from the lower Parts into the Cheſt; but beſides that ſuch aſcent of impure Vapours from the Guts, *&c.* into the Cheſt, where the Vital Parts are ſeated, would be very inconvenient and prejudicial, I think the Midriff is ſo compact a body, and its Membranes ſo cloſe, that we may either deny any *pores* at all, or however that they admit not any ſuch ſteams. The *larger* holes (being thoſe that ought to be reckon'd alone for ſuch) are, *firſt*, that which is very near its middle or centre, but ſomething towards the right ſide, which gives paſſage for the Trunk of the hollow Vein aſcending from the Liver. The *ſecond* is on the left ſide of the centre, being bigger than the former, and ſomewhat backwarder; and this ſerves for the letting forth of the Gullet and two Nerves which go to the Stomach. There is alſo a *third* hole more backwards by the *vertebræ*, for the through-fare of the great Artery, and the Vein without a fellow, and for the Nerve which Doctor *Willis* diſtinguiſhes from the wandring or eighth pair, by the name of the Intercoſtal.

Its Veſſels. The Midriff hath *Veſſels* of all ſorts; for it hath *Veins* ariſing from the Trunk of the hollow Vein, which are called *Venæ phrenicæ*, and alſo ſome twigs branching to it from the *Vena adipoſa*, or Fat-vein, ſo called becauſe it is moſtly beſtowed on the fat Membrane that inveſts the Kidneys.

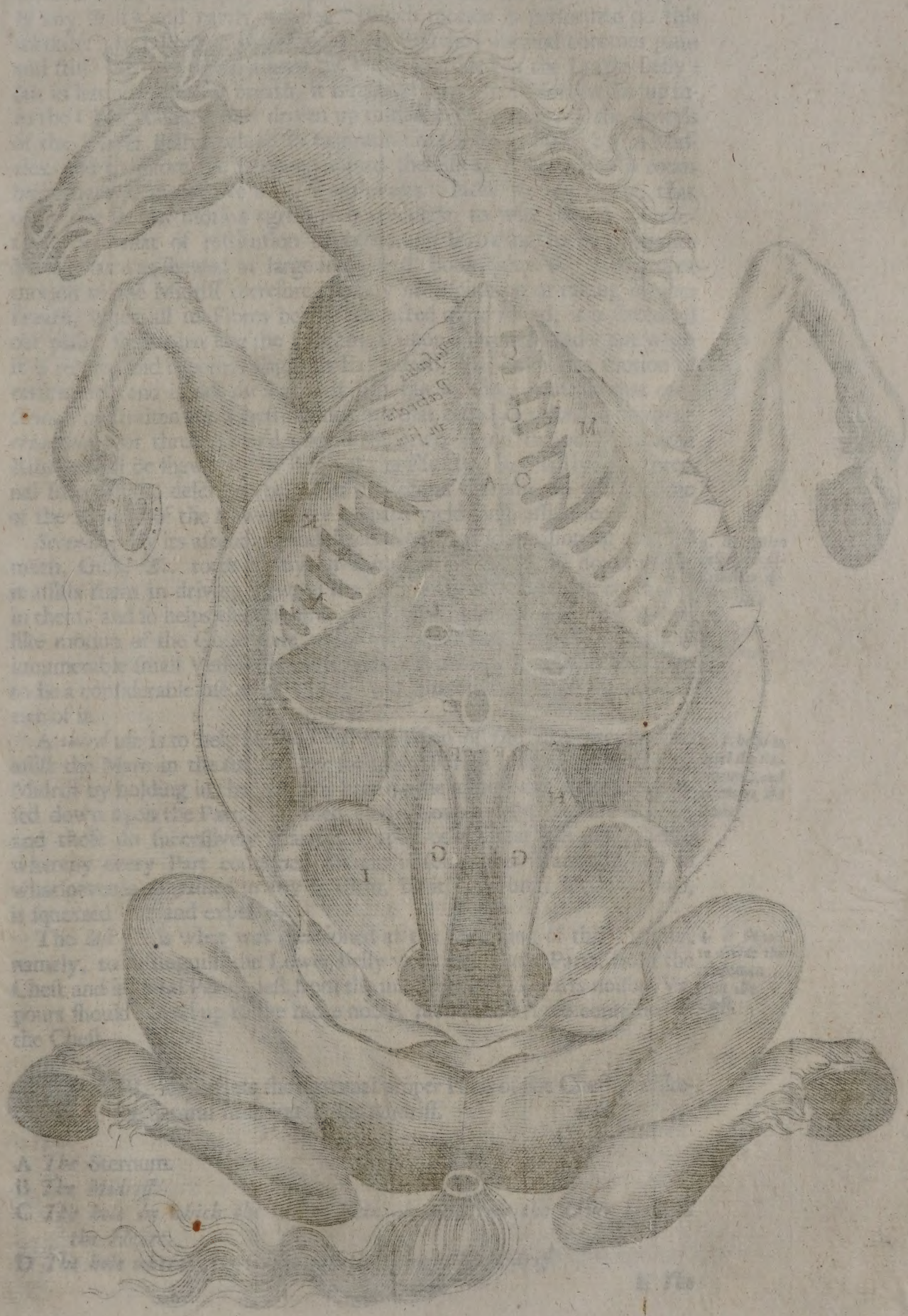
It hath *Arteries* from the Trunk of the great Artery, called alſo *Phrenicæ*.

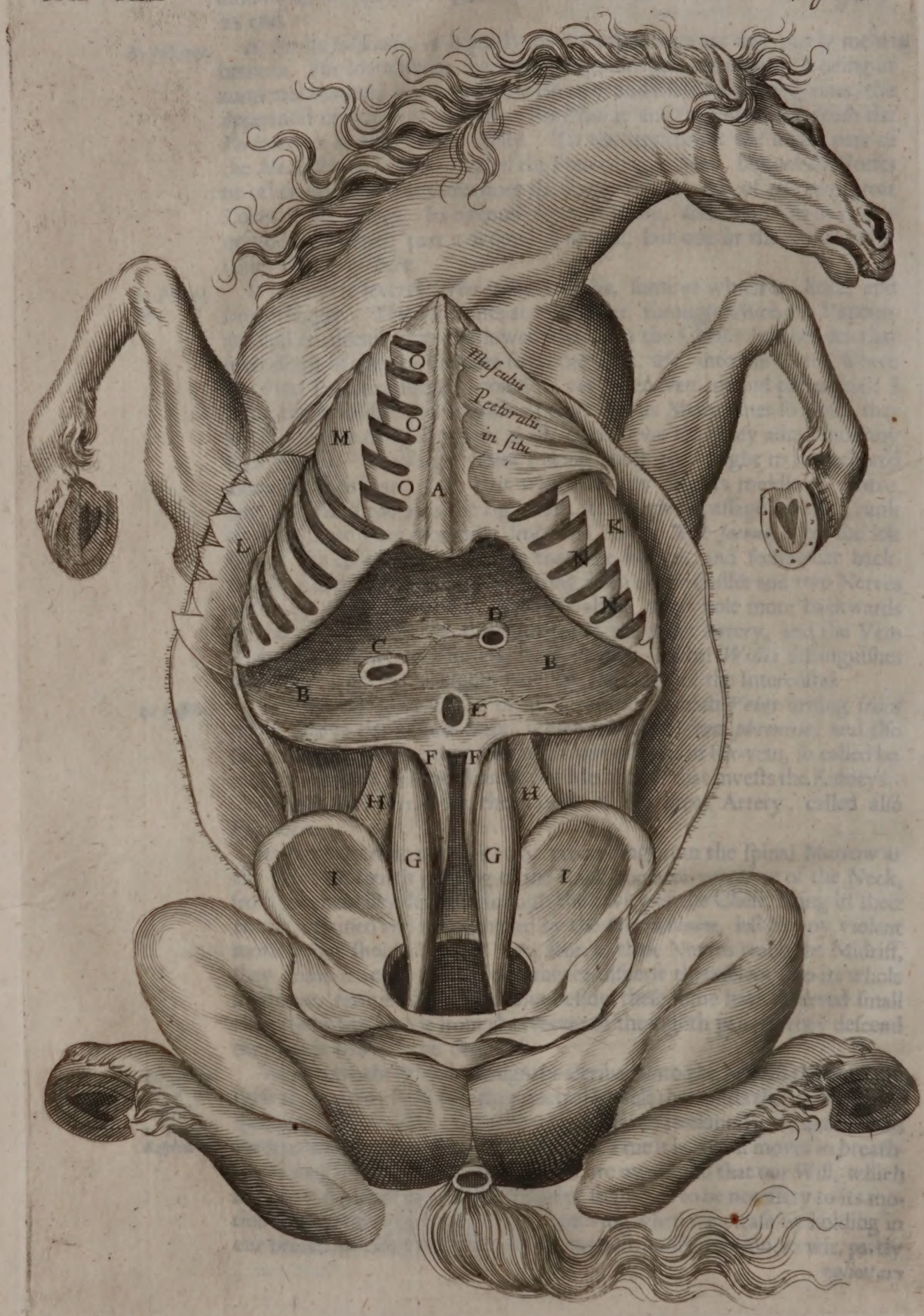
Its *Nerves* are in number two, proceeding from the ſpinal Marrow at the third or fourth jointing of the Rack-bones or *vertebræ* of the Neck, from whence they deſcend through the cavity of the Cheſt, being in their courſe ſuſtained and ſtrengthened by the *Mediaſtinum*, leſt by any violent motion they ſhould be hurt. As ſoon as theſe Nerves reach the Midriff, they enter it in its centre, and thence diſperſe themſelves into its whole ſubſtance, terminating in it. But beſides theſe ſome have obſerved ſmall twigs to be ſent into it from the Nerves of the eighth pair, as they deſcend through it toward the Stomach.

The ſeveral uſes of the Midriff. Various are the *Uſes* that might be aſcribed unto the Midriff, the chief are theſe that follow.

1. It aſſiſts Reſpiration. *Firſt*, It is the principal Muſcle that aſſiſts the action of Reſpiration. Which action whether it be animal and voluntary, or natural and involuntary, has occaſion'd great diſputes. True it is, that it moves in breathing as well while we ſleep, as when we are awake, ſo that our Will, which in ſleep is dormant as well as the Body, ſeems not to be neceſſary to its motion: and yet we can hinder it from moving when we pleaſe by holding in our breath. We may therefore call its motion, a mixt motion, to wit, partly

voluntary

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voluntary (or rather *ſpontaneous* in Beaſts, becauſe they have not properly any Will) and partly *natural.* Which motion is performed on this manner. In taking in ones breath it is ſtretched out and becomes plain and ſtiff, preſſing down a little the Parts contained in the Lower Belly: but in letting out ones breath, it is relaxed and aſcends ſomewhat up into the Cheſt, being partly driven up thither by the aſcent of the Bowels of the Lower Belly, which in expiration is a little ſtraitned by its Muſcles, and therefore the Parts contained therein as they have leſs room breadthways, muſt have more lengthways. Now we muſt note, that onely one ſort of motion agrees to one Muſcle, to wit, that of contraction; for that of reſtitution or relaxation is owing to the oppoſite Muſcle, as was ſhewed at large in the Firſt Book, *chap.* 6. The proper motion of the Midriff therefore is onely in Inſpiration or taking in ones breath, when all its Fibres being contracted quite round, it is ſtretched out plain, ſomewhat like the Parchment upon a Drum's head: but when it is relaxed and becomes flaggy in Expiration, that is onely a motion of reſtitution, and is not owing to it ſelf, but to thoſe Muſcles that conſtringe or ſtraiten the Cheſt, which are that called *ſacrolumbus*, and the *triangularis* or three-corner'd one, which two lie on the outſide of the Ribs as ſhall be ſhewn in the Book of the Muſcles; and laſtly, the internal Intercoſtals, deſcribed before in the ſecond Chapter, to which ſome of the Muſcles of the Lower Belly perhaps yield ſome aſſiſtance.

Secondly, By its aſcending and deſcending, and ſo occaſioning the Stomach, Guts, *&c.* to be always in a motion upwards and downwards, it aſſiſts them in driving forward the Liquors or whatever elſe contained in them, and ſo helps the diſtribution of the Chyle, which by the worm-like motion of the Guts alone could not ſo well be ſent through thoſe innumerable ſmall Veſſels through which it is to paſs. And this I take to be a conſiderable uſe of it, though few Anatomiſts have taken any notice of it.

2. *Its motion helps the diſtribution of the Chyle.*

A *third* uſe is to help forward the expulſion of the Excrements, and aſſiſt the Mare in the time of her foaling. For in both thoſe offices the Midriff by holding in the breath is kept on the tenters as it were and preſſed down upon the Parts contained in the Lower Belly that are next it, and thoſe do ſucceſſively bear hard upon others that are next them, whereby every Part contained therein is ſomewhat ſtraitned, and ſo whatſoever is contained in any of them, be it the Dung, Urine or Foal, is ſqueezed out and expelled.

3 *It helps to expel the Excrements, and in Mares the Foal.*

The *laſt* uſe is what was mentioned at the beginning of this Chapter, namely, to diſtinguiſh the Lower Belly with its natural Parts, from the Cheſt and its vital Parts; leſt from the inferiour ignoble Parts noiſom Vapours ſhould aſcend up to the more noble, ſuch as are thoſe contained in the Cheſt.

4. *It ſerves to divide the* Abdomen *from the Cheſt.*

Table XIII. Repreſents the External proper Parts of the Cheſt, as likewiſe the natural ſituation of the Midriff.

A *The* Sternum.
B *The Midriff.*
C *The hole by which the hollow Vein aſcends from the Liver towards the Heart.*
D *The hole whereby the Gullet paſſeth through the Midriff.*

E *The hole whereby the deſcendent Trunk of the great Artery paſſes through the Midriff.*
FF *The two Appendices or Productions of the Midriff.*
GG *The Muſcles termed* Pſoæ *in their natural ſituation.*
HH *The* Muſculi Quadrati *or ſquare Muſcles of the Loyns.*
II *The Internal cavity of the Flank-bone.*
K *The Muſcle called* Serratus major Anticus *in its proper place.*
L *The ſame Muſcle removed out of its place and turned back, the better to ſhew the* Serratus minor *and other Parts underneath it.*
M *The* Serratus Anticus minor *or leſſer foreſide Saw-muſcle in its place.*
NNN *Several of the External Intercoſtal Muſcles.*
OOO *The Cartilaginous or griſtly Parts of the Ribs faſtened to the* ſternum *or Breaſt-bone.*

CHAP. V.

Of the Partition-membrane called Mediaſtinum.

The Mediaſtinum why ſo called.

THIS Membrane is called by the Latins *Mediaſtinum*, from its office of partitioning or dividing, becauſe it divides the Cheſt into two parts, ſtanding acroſs the *middle* of it.

Its riſe and ſubſtance.

It is derived or hath its original from the *Pleura* or Rib-coat, of which we have already ſpoken in the third Chapter. For the *Pleura* ſpringing from the Back-bone, keeps its way on each ſide of the cavity of the Cheſt (cloathing the inſide of the Ribs) till it comes to the Breaſt-bone, where the two Membranes join together, but do *not* unite into one. From the Breaſt-bone theſe two Membranes hold a direct courſe back again towards the Back-bone through the middle of the Cheſt, but before they have gone an Inch, they begin to ſeparate again, and that ſo far from one another by degrees, as to make a cavity wide enough for containing the Heart and the Heart-bag. But when they are arrived near the Back, they join together again. Note that the *Mediaſtinum* being compoſed of the doubling of the *Pleura*, muſt conſiſt of four Membranes when united, (though onely of two where divided) ſeeing the *Pleura* it ſelf conſiſts of two. It is wholly membranous, as is the *Pleura* of which it is formed; ſmooth on the outſide towards the Lungs, but rough on its inſide towards the Heart, by reaſon that the Heart-bag adheres to it by ſeveral Fibres.

Its Veſſels.

Between the duplicature of this Membrane there are many ſmall Veſſels of all ſorts diſperſed. For firſt there are *Veins* branching to it from the *Phrenica* or Midriff-vein and from the ſolitary Vein or *Vena ſine pari*; it has likewiſe one proper Vein of its own from the ſubclavian branch, called after its own name, *Mediaſtina*. Secondly, its *Arteries* come from the *Phrenica* or Midriff-artery, which ſpring out of the deſcending Trunk of the great Artery. Thirdly, it hath *Nerves* from the Phrenick or Midriff twigs of thoſe two branches of the eighth pair that deſcend through it to the upper orifice of the Stomach. *Bartholin* aſcribes alſo *Lymphedu*ctſ unto it.

The

The uſe of the *Mediaſtinum* is firſt, to divide the Cheſt and Lungs into two parts, that if any hurtfull Accident ſhould happen to one of the ſides, the other notwithſtanding might be preſerved. And this hath been obſerved by Anatomiſts, who have found in diſſections the one ſide or Lobe of the Lungs waſted and almoſt dryed away in Phthiſical and Conſumptive Perſons, and at the ſame time the other hath been perfectly freſh and ſound. And it hath been likewiſe ſeen and obſerved in wounds of the Cheſt, that if therewith one Lobe of the Lungs ſhould happen to be hurt ſo much as to occaſion the loſs of the uſe of that Lobe, yet the other by performing his part hath preſerved life. *Its uſes.*

The next uſe of the *Mediaſtinum* is to permit the Heart in the Heart-bag to hang dangling in a free poſture, that in its motion it might not ſtrike againſt the bony ſides of the Cheſt.

Again, it ſerves to ſuſtain and preſerve the Veſſels running through it, and by its being knit to the Midriff, preſerves *that* alſo from being drawn too much downwards by the weight of the Bowels of the Lower Belly, eſpecially by the Liver, whoſe ſuſpenſory Ligament hangs by it.

CHAP. VI.

Of the Thymus *or great Kernel at the Throat; and of the Purſe of the Heart called* Pericardium, *together with the water contained therein.*

THE *Thymus* (named the Sweet-bread by ſome) is a glandulous or kernelly body, ſoft and ſpongie, placed in the upper part of the Cheſt near the hole of the Throat, lying upon the ends of the Clavicles or Collar-bones. *What the Thymus is.*

It hath its name *Thymus* from the leaf of Time, which it very much reſembleth in ſhape.

Its *uſe* is to ſerve as a Boulſter or Pillow for the Veins and Arteries to paſs over or lie upon, to keep them from the hardneſs of the Collar-bones, the ſharpneſs of which would elſe be apt to break them or fret them aſunder. *Its uſe.*

Now the Veſſels which do croſs over this *Thymus* are the hollow Vein and the great Artery, with the many diviſions and branches of the ſame, which are in number many, diſperſed from thence into moſt of the extreme Parts of the forepart of the Body, as ſome to the Shoulder-blades, and ſo down the Fore-legs; again, ſome to the Neck and Head, namely the internal and external Jugular Veins, and the Carotid Arteries; as alſo thoſe branches which run all along the Belly, which are by us Farriers called the Liver-veins. This Kernel is bigger in Foals than it is in grown Horſes in proportion to their Bodies; and in Calves it is pretty large, and is reckoned for a dainty delicate bit. *The Veſſels which paſs over it.*

Next come we to treat of the *Pericardium*, or Purſe of the Heart, or Heart-bag, for by theſe ſeveral nominations or names it goes. This is *What the Pericardium is.*

that Coat or Skin which compaſſeth the Heart, and in which the Heart hangeth, it being for that purpoſe made in figure like it.

From whence it takes its original. It takes its original at the baſis or upper and broad end of the Heart, from the outer Coats which compaſs the Veſſels that enter into the Heart, which Coats do ſpring from the *Pleura*.

The ſubſtance of the Pericardium. Its *ſubſtance* is thick and ſomething hard, though not ſo hard as to hurt the Lungs when it preſſeth againſt them, or they againſt it; neither is it too ſoft, leſt it ſhould it ſelf be hurt by the hardneſs of the Ribs, which in ſtrong pulſations of the Heart it beats againſt, the *Mediaſtinum* onely coming between: but being placed between two contraries, I mean, between the ſoft Lungs and hard Bones, it ought to have its ſubſtance of a middle nature between both. On the outſide it is rough and fibrous, adhering in many places to the *Mediaſtinum*; but within, it is ſmooth and ſlippery, that the Heart might move more freely in it.

Its Perforations. It is perforated in *five* places; namely on the *right* ſide by the aſcending Trunk of the hollow Vein, which comes up from the Liver and enters the right Ventricle of the Heart; and by the Subclavian Vein which deſcends from the Channel-bones into the ſame Ventricle; and thirdly by the Pulmonary Artery which goes out of the right Ventricle into the Lungs. On its *left* ſide it is perforated by the Pulmonary Vein which comes from the Lungs and enters the left Ventricle of the Heart; and laſtly by the great Artery that paſſes out of the ſaid Ventricle.

Its Veſſels. The *Veins* that it is furniſhed with, it receiveth at the lower part of it from the *Phrenick* or Midriff-vein, and at the upper part from the Axillaries; but the Veſſels from each place are mighty ſmall.

There are no Arteries derived to it from any place, that are viſible; and the reaſon ſuppoſed is, becauſe it is ſo near the Heart, that it is immediately ſupplied from it with vital heat and ſpirit. But ſeeing the Heart it ſelf is not without Arteries, though it be reckon'd the fountain of life, much leſs can any other part be ſuppoſed to be, and therefore neither this, though they are ſo ſlender as not to be diſcernible.

Thoſe ſmall *Nerves* it is furniſhed with, are branched to it from the left recurrent Nerves of the eighth or wandring pair.

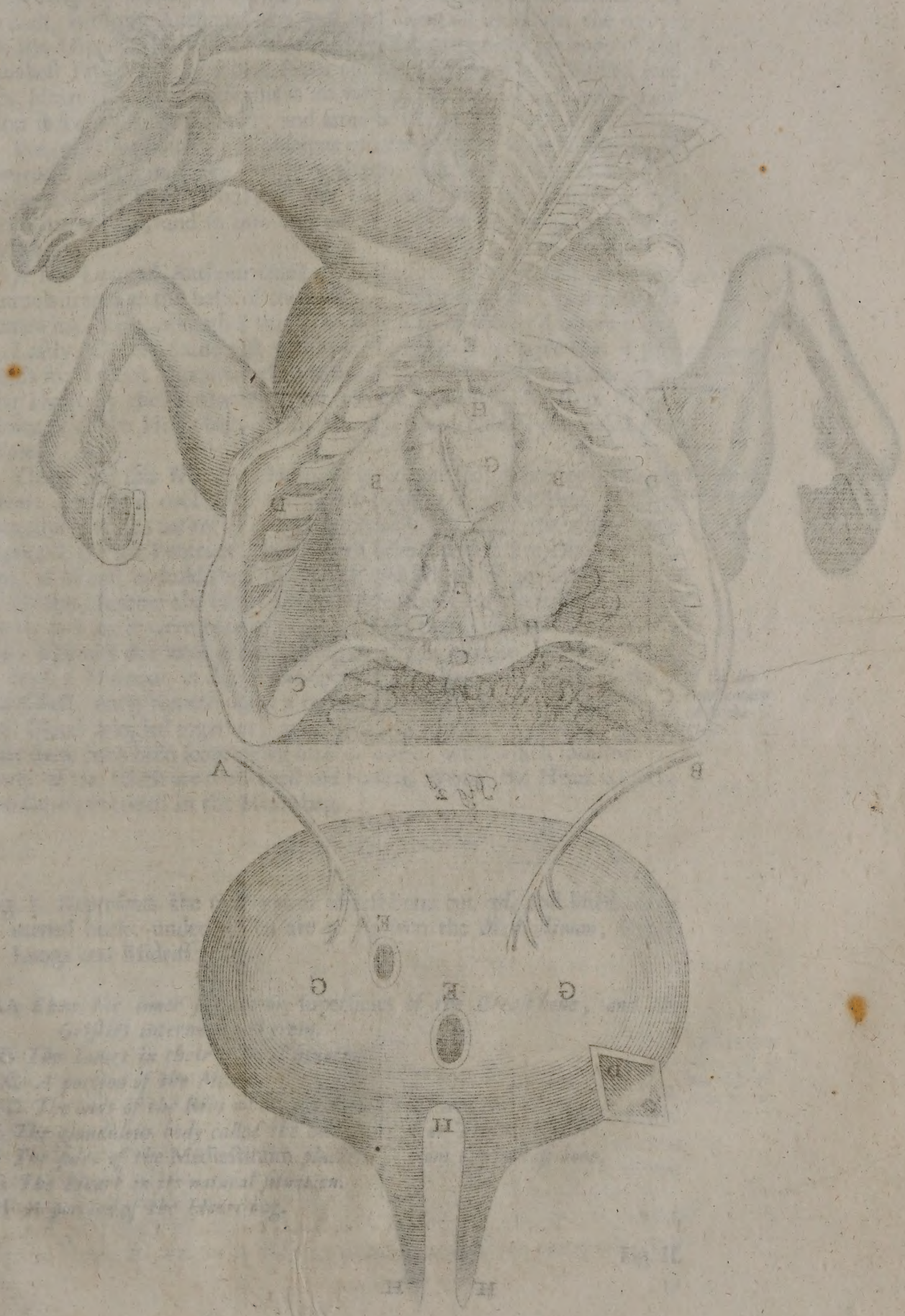
To theſe Veſſels *Bartholin* adds *Lymphedu&ts*, which ſerve to drink up part of the Liquor contained in the Heart-bag, to hinder its two great encreaſe.

Its uſe. Next come we to the *uſe* of the Heart-bag, which is, to cover and preſerve the Heart, and to contain a certain moiſture or Humour in it for the uſes after-mentioned. Now concerning this Humour there are various diſcourſes and different opinions of Authours, I mean, as to the fountain from whence it proceeds; for ſome will have it, that it is fed by Liquors which we drink, of which opinion is the Learned *Hippocrates*, whence in his Book *de Corde* he ſaith, that the Heart dwelleth in a Bladder, becauſe of the reſemblance the Humour in the Heart-bag hath to that in the bladder of Urine; though at the ſame time he denies this Water or Humour to have any acrimony or brackiſhneſs, as the Water contained in the bladder of Urine hath.

Of the Water contained in the Pericardium.

And to confirm this Opinion of his, that this Humour contained in the Heart-bag doth proceed from Liquors taken in at the Mouth, he cites an Experiment to be tried on a Pigg, (though I ſuppoſe any other Creature may ſerve as well) which after it is kept faſting for ſome time ſhould have given it to drink Water or Milk mingled with Vermillion, and after

it



TAB. XIV

Fig. 1.

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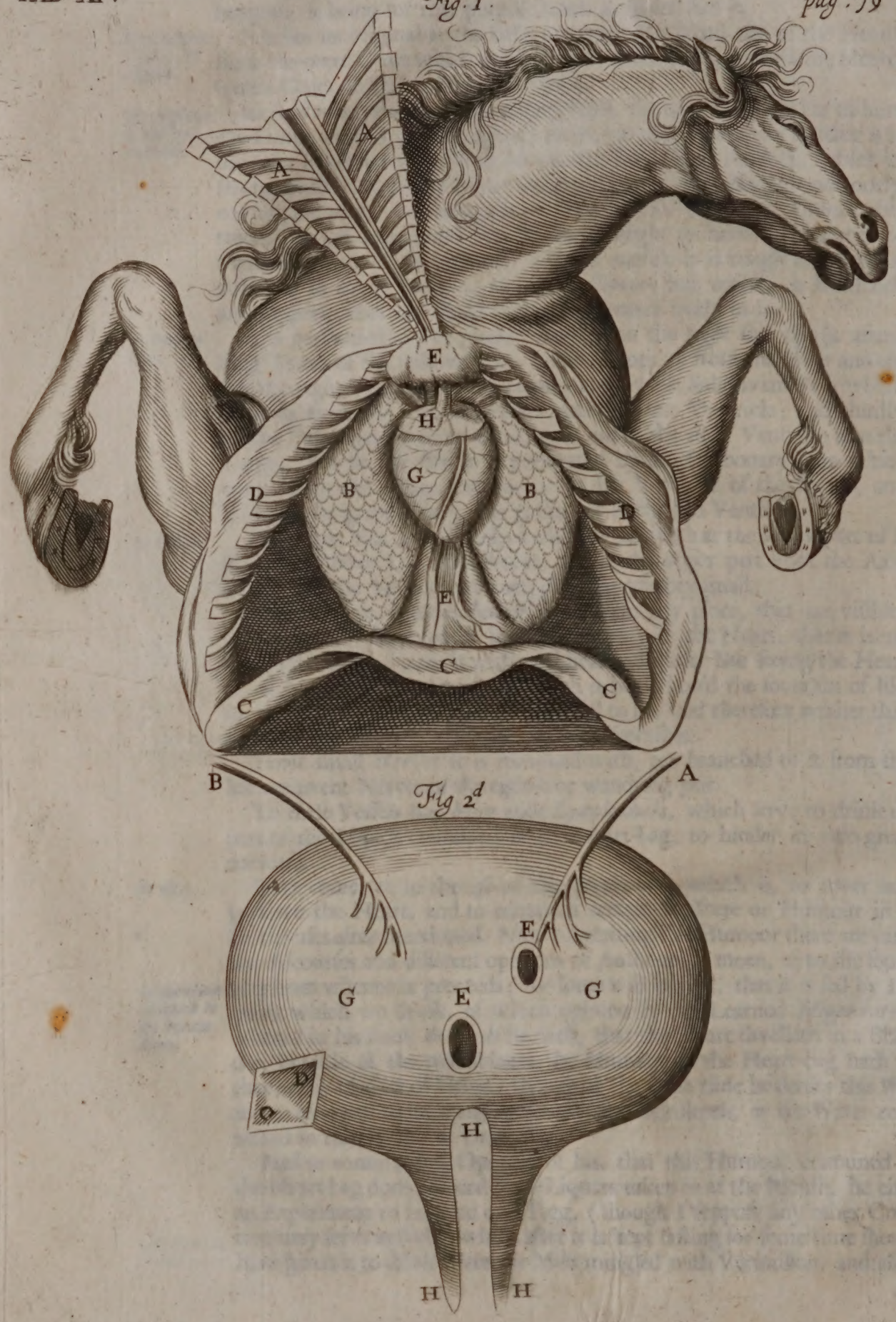


Fig 2d

it hath drunk it, ſhould immediately be killed, and as ſoon after as poſſible have his Wind-pipe opened, and alſo all or moſt of its branches, in which, ſaith my Authour, you will find along all its inſide, the colour of the Liquor which it drank, even to the extremities or ends of the ſmalleſt Pipes; out of which Pipes (ſaith he) part of it is diſtilled into the Heart-bag. I confeſs this is no very probable Opinion, but I mention it for the great antiquity and fame of the Authour of it.

But other Authours are of opinions contrary to this, ſome ſaying that it proceeds from a moiſture, ſlaver or ſpittle, which diſtils out of the Kernels under the Tongue into the Weazand, and from thence into the Arteries and Heart, and ſo into the Heart-bag. But this is as improbable as the former.

A late Learned Authour thinks that it iſſues out of certain Glands or Kernels ſeated at the baſis of the Heart. And this is an Opinion that is ſomewhat likely, though I think the next is to be preferr'd before it.

Laſtly, Others (amongſt whom is *Bartholin*) conceive that it proceeds from moiſt Vapours and Exhalations forced out of the Humours of the Heart by the motion and heat thereof, which being ſtopt by the cloſeneſs of the Heart-bag, are by its reſpective coldneſs congealed into Water. *See* Bartholin, *lib.* 2. *chap.* 5.

The *uſe* of this Water or Humour is, in the firſt place, to keep the Heart moiſt and cool; for the Heart being a very hot Part, requires ſomething of this nature to cool it, eſpecially if that be true which ſome report of the left Ventricle, that it hath been found in live Diſſections ſo hot, as almoſt to ſcald the Diſſector's finger which he put into it. *The uſes of the Water.*

By this Humour the Heart alſo becometh more eaſy in its motion, for by it, it is as it were born or buoy'd up, ſo that it ſwimmeth in a manner, whereby the ſenſe or feeling of the weight of it is taken away.

Such a Humour as this before-ſpoken of is alſo found in the cavity of the Cheſt, onely ſomething of a more ruddy colour, looking like Water and Bloud mingled together; and this I have never found wanting, but that there hath been ſome either little or much; with which moiſture the Parts of the Cheſt are moiſtened and cooled, even as the Heart is by the moiſture contained in the Heart-bag. *Of the Humour contained in the Cheſt.*

Table XIV.

Fig. I. Repreſents the *Sternum* or Breaſt-bone cut off, and lifted up or turned back, under which are to be ſeen the *Mediaſtinum*, Heart, Lungs and Midriff.

AA *Shew the inner ſurface or* ſuperficies *of the Breaſt-bone, and the Griſtles interwoven therein.*
BB *The Lungs in their natural ſituation.*
CC *A portion of the Midriff.*
DD *The ends of the Ribs where the Breaſt-bone was cut off.*
E *The glandulous body called the Sweet-bread or* Thymus.
F *The ſides of the* Mediaſtinum *plucked off from the Breaſt-bone.*
G *The Heart in its natural ſituation.*
H *A portion of the Heart-bag.*

Fig. II.

Fig. II. Repreſents the Diaphragm and its Proceſſes.

A *The left Nerve.*
B *The right Nerve.*
C *The upper Coat or Skin of the Diaphragm.*
D *The naked ſubſtance of the Midriff, or the Diaphragm laid bare.*
E *A hole for the Gullet to paſs through.*
F *A hole for the hollow Vein to paſs through.*
G *The membranous or nervous part of the Midriff, being its centre.*
HHH *The Proceſſes or* Appendices *of the Midriff, betwixt which the Trunk of the great Artery doth deſcend.*

CHAP. VII.

Of the Heart.

The Heart a principal Part.

THERE is none can be ſo ignorant of the Parts of the Body, as not to know that the Heart is one of the *principal* Parts thereof: for as it is the fountain of the Vital faculty and power, it ought to be ſo ſtyled. It is alſo the place of natural heat, the root of the Arteries from whence they all ſpring. It is moreover the Authour of the Pulſe, and the firſt Bowel living (as I ſhall more at large declare in the following Chapter) and the laſt dying.

From whence it derives its name Cor.

It is called in Latine *Cor, à currendo* from running, becauſe of its continual motion.

Its ſituation.

It is onely one in number, *ſituated* in the midſt of the cavity of the Cheſt, as well for its ſecurity, as for the equal ballancing of that part of the Body; in which place it is incompaſſed by the Lobes of the Lungs.

Yet notwithſtanding the ſituation of it in the middle part of the Cheſt, it is to be underſtood that not the whole Heart but onely the baſis or root of it is directly in the middle; for the point of it leans toward the left ſide, by reaſon of the ſmallneſs of the compaſs it hath to perform its motion in; for it would be apt to ſtrike againſt the Midriff, ſhould it not be ſo drawn to one ſide, which would not onely hinder its *own* motion, but alſo indanger the violating of the Midriff and hinder *its* motion; for *it* alſo is known to have a perpetual motion as well as the Heart.

Why the Pulſe is felt on the left ſide and not the right.

And it is from the point of the Heart's inclining to the left ſide, that the motion of the Heart or its pulſe is ſo plain to be felt on that ſide: which not being equally to be felt on the right, many, who have not taken the pains of looking or inſpecting into Bodies to ſee the contrary, do conclude, that the Heart is ſituated altogether on the left ſide, and that it is not the point alone which they feel beat, but the whole Heart.

Another reaſon there is why it ſhould incline to the left ſide, namely, becauſe the aſcendent Trunk of *Vena cava* lieth on the right ſide, ſo that were the point not drawn ſomething to the other ſide, it would be apt

to

to lie upon or ſtrike againſt that Veſſel, and ſo hinder the aſcent of the Bloud which is brought from the Liver by that Vein to the Heart.

The motion of the Heart.

The Heart has a double motion, Contraction called its *ſyſtole*, and Relaxation called its *diaſtole*. (Though this latter may rather be deemed a ceaſing from motion, than a motion.) While it is relaxed or becomes flaggy and looſe, it receives the Bloud into its Ventricles out of the hollow Vein and Lung-vein; out of the former into its right Ventricle, and out of the latter into its left. And when it contracts it ſelf, it expels or ſquirts out the Bloud out of its Ventricles into the Lung-artery and great Artery; out of the right Ventricle into the Lung-artery, and out of the left into the great Artery.

The reaſon of the Pulſe.

As to the pulſation or beating of the Heart, it is very difficult, if not impoſſible to give any ſatisfactory reaſon of it. Some impute it to the flowing in of the Animal Spirits by the Nerves; others to the boiling and rarefaction of the Bloud in its Ventricles. 'Tis moſt certain that the muſcular Fibres of the Heart are the immediate inſtruments of its motion, and that theſe receive their power to move, from the Animal Spirits conveyed by the Nerves: but what it is that puts theſe Fibres upon ſuch a reciprocal motion of contraction and relaxation as the Heart obſerves, is the greateſt difficulty to determine. The greateſt Anatomiſts have confeſt their ignorance in this point: I ſhall not therefore pretend to give a reaſon of it, but admire the wiſedom of the great Creator in framing ſuch an Engine, ſo neceſſary for the conveying life, heat and nouriſhment to all the Parts of the Body. Waving this then, I ſhall proceed to the further deſcription of the Heart.

The figure of the Heart.

The *figure* of the Heart is pyramidal or conick, that is, it is broad at the baſis or bottom, and narrow at its ſummity or top. On the fore-ſide it is boſſy or bunching, but on the hinder ſide more flat. It is ſometimes longer and ſometimes ſhorter, as thus: When in its motion it is contracted (at which time it pours out the Bloud) then is it ſhorter, but broader; and again when it is dilated, at which time it receives in the Bloud, then is it longer and narrower.

Its ſubſtance.

Its *ſubſtance* is a ſolid, thick and compact fleſh, that it might the better indure the perpetuity of the motion, and with more force drive the Bloud into the extreme or fartheſt Parts of the Body. It conſiſteth moſtly of muſculary or fleſhy Fibres, a few of which run ſtreight and are outmoſt, but the far greateſt part run ſlanting or rather ſpiral-wiſe, eſpecially towards its point, reſembling ſomewhat the winding-rings of a Snail's ſhell.

Its connexion.

It is tied by the mediation of the Heart-bag to the *Mediaſtinum* and by its own Veſſels to ſeveral Parts of the Body.

Its External Parts.

Its Parts are ſome *External* and ſome *Internal*. Thoſe which be *External* or outward, are the Purſe, the Coat, and the Fat; to which may be added ſome of its Veſſels.

As to the *Purſe* or Heart-bag, we have treated of it in the foregoing Chapter. As to the *Veſſels*, ſome of them encompaſs the Heart, as the Coronary Vein and Arteries; others reach into its Entrances and into the Ventricles, and thoſe are the Aſcendent and Deſcendent Trunks of the hollow Vein and Great Artery, alſo the Pulmonary Veſſels. Of the Coronaries we ſhall ſpeak by and by in this Chapter; but of the reſt, in the next.

Its Coat. It hath a *Coat* proper to it ſelf, like the Coat of a Muſcle, for its greater firmneſs, which Coat ſticks ſo cloſe to it, that it is hard to be ſeparated or removed from it. It is the ſame with the outer Coat of the Great Artery, as that Skin which cloaths the inſide of its Ventricles is continued unto and conſtitutes the inmoſt Membrane of that Artery.

Its Fat. The Heart becauſe of its continual motion and great heat, is plentifully ſtored with *Fat*, to keep it from being over-dried, which Fat is moſt of it placed at the baſis or bottom of it; for its point hanging in the Humour contained in the Heart-bag is continually moiſtned with that, ſo that it ſtands not in need of being moiſtned or cooled any other way.

The difference between the Fat of the Heart and other Fat. Yet thus much notice is to be taken, as to this Fat which grows to the Heart, that it differs in conſiſtence from all or moſt of the other Fat of the whole Body, as being much harder: for ſhould the Heart, which is a very hot Part, have any ſuch ſoft Fat near it, it would certainly melt it. And as the Fat which grows or ſticks to the remoter Parts of the Body differs from this in nature, ſo hath it alſo a name different from this; for the former is called *pimele*, which ſignifies a kind of greaſie Fat; but the latter is called *Adeps*, which is to ſay Tallow, and is indeed as hard as Tallow, differing much from *pimele* or Greaſe.

The External Veſſels of the Heart. Next come we to the *Veſſels* of the Heart, and of theſe it is furniſhed with all ſorts; ſome of which do compaſs it round about at its baſis, like a Garland, which are one Vein and two Arteries.

One Vein. The *Vein*, from its encompaſſing or encircling it round, is called *Coronaria*, or the Crown-vein, which Vein ariſes from the Trunk of the hollow Vein a little before its entrance into the right Earlet of the Heart. Small branches do ſpring from this Coronary Vein, and are diſperſed or ſprinkled all down the ſurface or outſide of the Heart from the baſis to the point.

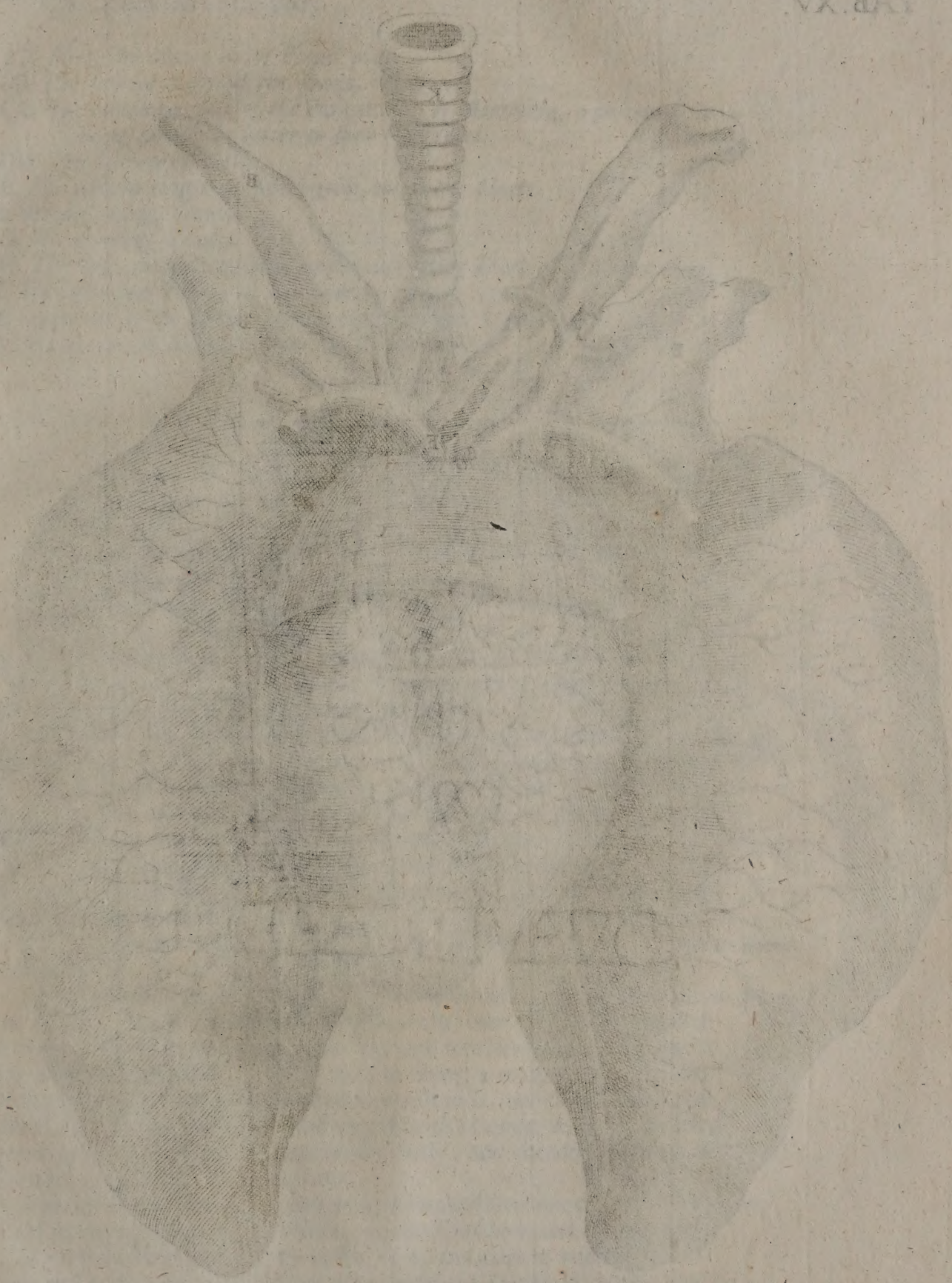
Two Arteries. Its *Arteries* are in number two, which are alſo called *Coronariæ* or Crown-arteries, from their encircling the Heart as the Vein does, where like it they diſperſe ſmall branches about all the external ſurface of the Heart, furniſhing it with arterial Bloud for its life and nouriſhment.

Their Valves. There is obſerved at the original of each of theſe Arteries, as is likewiſe in the Vein, a certain *Valve* which is to be ſeen if you diſſect either Veſſel, opening it a little before it paſſeth out of the Heart-bag; which Valve or Floud-gate in the Vein lets the Bloud into the Heart, but ſuffers none to come out again that way; and in the Artery it permits the Bloud to iſſue out of the Heart, but will let none return back out of it into the Heart.

Nerves. The Heart is alſo furniſhed with very many but very ſmall *Nerves*, ſpringing from branches of the eighth pair, which branches are thoſe that are ſent to the Heart-bag.

They branch into and enter the Heart in three ſeveral places; firſt, one enters into the Heart it ſelf, another into the Earlets of the Heart, and a third into its Veſſels.

Thus much of the Parts of the Heart which in ſome regard may be called *External*; in the next Chapter we ſhall proceed to thoſe that are more *Internal*.



TAB. XV.

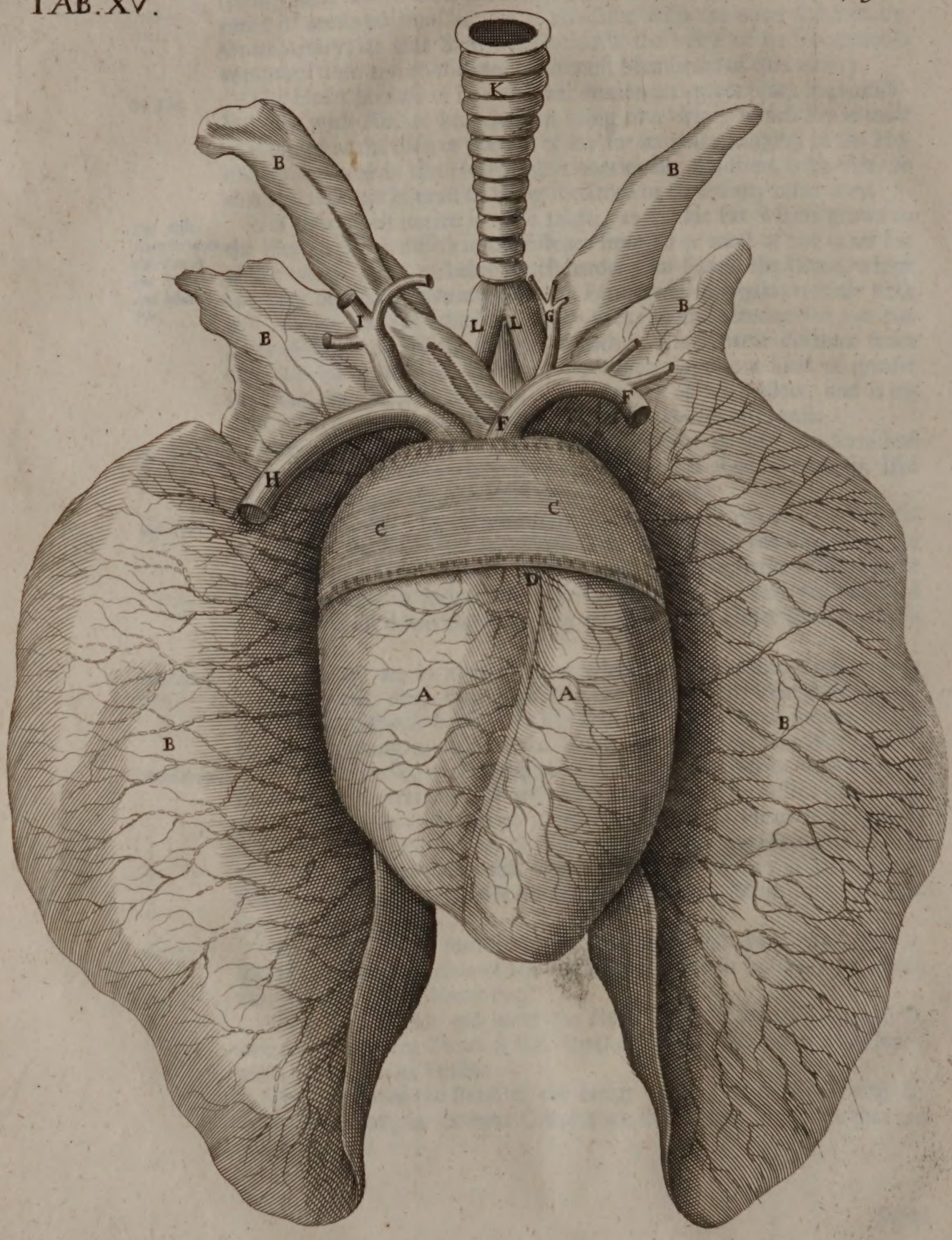


Table XV. Repreſenteth the Heart and Lungs in their natural poſture, but taken out of the Body.

AA *Shew the Heart in its Proper place.*
BB *The ſeveral Lobes of the Lungs.*
CC *The remaining part of the* Pericardium *or Heart-bag, a portion of it being cut off the better to ſhew the Heart.*
DD *The Coronary Veſſels.*
E *The* Arteria magna *or* Aorta *going out of the Heart.*
F *Its deſcending Trunk.*
G *Its aſcending Trunks.*
H *The* Vena cava deſcendens, *or the deſcending Trunk of the hollow Vein.*
I *The aſcending Trunks of the ſame.*
K *A portion of the* Aſpera Arteria *or Wind-pipe.*
L *Its diviſion or branching into the Lungs.*

CHAP. VIII.

Of the Ventricles, internal Veſſels, Valves and Earlets of the Heart.

WE will firſt ſpeak of the Ventricles or *Sinus's* of the Heart, being in number two, on each ſide one, diſtinguiſhed or divided by a fleſhy partition into a right and a left.

The right (called the right *Sinus* or Ventricle, and by ſome the Cave or Chamber) is ſomewhat bigger than the left, becauſe it receives as well that Bloud which is ſpent upon the nouriſhment of the Lungs, through which the Bloud paſſes from this Ventricle to the left, as that which actually is conveyed into the left, and from thence ſent forth by the Arteries into all parts of the Body. But its larger capacity is onely in reſpect of its width, for the left is rather longer than it, as reaching nearer the tip of the Heart. *The right Ventricle.*

It is in *figure* not exactly round, but rather ſemicircular, or half-moon faſhioned. *Its figure.*

The *ſubſtance* of its ſides is not ſo hard and thick as is that of the left, nor is the ſurface of its inner cavity ſo uneven; nor has it ſo many and ſo ſtrong fleſhy Fibres reaching this way and that way, as the left hath. For it was not neceſſary it ſhould be of ſo ſtrong a compoſure as the left, ſeeing neither is the Bloud rarefied ſo much in it, nor does it ſend the Bloud out of it to any greater diſtance than the Lungs, whereas the left pours it into the remoteſt Parts of the Body, and therefore requires a ſtronger conſtitution to ſquirt it out. *Its ſubſtance.*

The *uſe* of this Ventricle is firſt to receive the Bloud out of the hollow Vein returning from the circulation, as alſo the Chyle and *Lympha* mingled with the Bloud, out of the axillar Vein, and then to attenuate, concoct and inſpirit them for the nouriſhment of the Lungs, to which they *Its uſe.*

are carried under the form of Bloud by the Pulmonary Artery, otherwiſe called the Arterial vein. But it is but a very ſmall portion of the Bloud that is ſpent upon the Lungs, the greateſt part of it paſſing by the Pulmonary Vein to the left Ventricle, there to receive a greater perfection.

Why Fiſh have but one Ventricle.

Now it is worth obſervation in this place, that ſuch Creatures as live in the Water, as Fiſh in general, which have no Lungs, have but one Ventricle in their Heart. For the reaſon why Animals that live upon the Land have two Ventricles, being, that the Bloud as it paſſes from one to the other, ſhould be conveyed through the Lungs, there to be ventilated and cooled by the Air drawn in in inſpiration; and ſeeing Fiſh live in a cold Element, *viz.* the Water, which encompaſſes their whole Body, *that*, of it ſelf, is ſufficient to attemper the heat of the Bloud; therefore as it is impoſſible they ſhould make any uſe of Lungs in the Water, ſo there ſeems to be no need of them, nor conſequently of two Ventricles in the Heart, which are neceſſary for Land-animals that have Lungs, and breathe in the free Air. How far Water approaches to the nature of Air, or whether there be any truly airy particles contained in the pores of the Water; and if there be, whether there be any way imaginable whereby they can inſinuate themſelves into the Bloud and Hearts of Fiſhes, are Points too nice and philoſophical for me to intermeddle with. But ſeeing Fiſh can live ſo brisk for very many years without reſpiration (at leaſt properly ſo called, or that we can conceive of) one would ſuſpect that ſome of our late Anatomiſts attribute too much virtue to the Air that we breathe in, as if it were *the All* that continues the Vital flame as they ſpeak, and that the Vital heat and ſpirit are no otherwiſe owing to the Heart, than as like an Engine it keeps the Bloud in motion, and diſtributes it with the Spirits into all Parts of the Body by the Arteries. But this by the bye.

The left Ventricle. Its largeneſs.

Next come we to the *left* Ventricle, which in magnitude doth not equal the former, it being much leſs, by reaſon it is to contain a leſs quantity of Bloud than the right Ventricle doth, part of that Bloud that comes out of the right, being ſpent upon the nouriſhment of the Lungs, before it reaches the left.

Its figure.

This left Ventricle differs alſo in *figure* from the right: for as the right is obſerved to be ſemicircular, the left is almoſt round and longer, reaching almoſt down to the point of the Heart, which the other doth not.

Its ſides are thicker,

Likewiſe the fleſh or *wall* of the left is much *thicker* than that of the other, and that partly becauſe of the ſmallneſs of the cavity, which the narrower it is, muſt needs leave the ſides ſo much the thicker. Onely the left ſide of this Ventricle near the lower end or tip of the Heart, is thinner than any part of the ſides of the right.

and harder than thoſe of the right.

Alſo it is *harder* and more compact than the other, that the Vital Spirits might not exhale or evaporate, and that its conſtriction might be the ſtronger, ſo that the Bloud might with more force be thrown or pulſt out and vented into the fartheſt parts of the Body.

Its uſe.

Into this Ventricle is the Bloud received out of the Lungs by the Pulmonary Vein (otherwiſe called the veinous Artery.) Which Bloud when it is ſquirted out of this Ventricle into the great Artery, differs very much in colour from that which iſſues out of the right Ventricle into the Pulmonary Artery: for this latter is of a dark purple colour, but the former of a florid ſcarlet. But moſt think that this alteration of colour is not

ſo

ſo much owing to any ſupereminent virtue in this Ventricle above the right, as to the particles of Air that inſinuate themſelves into the Bloud in the Lungs whiles it paſſes out of the Pulmonary Artery into the Pulmonary Vein; for Dr. *Lower* affirmeth, that if in Live-diſſections one open the Pulmonary Vein in its paſſage from the Lungs to the left Ventricle, the Bloud will appear to be of the ſame ſcarlet colour as when it comes out of the ſaid Ventricle. Suppoſing this to be ſo (which I think we may do upon the teſtimony of ſo worthy and creditable an Authour) yet it cannot be denied but that the airy particles muſt be more intimately mixed with the Bloud by the great agitation it receives in the left Ventricle, ſo that we may ſtill conſent to the Ancients, that Vital Spirits (in which, Air ſeems to be a main Ingredient) are perfected and rectified to their height (as it were) in it more than in the right. The uſe therefore of the left Ventricle is to perfect the Vital Spirits, and to tranſmit them, together with the Bloud, by the Arteries over all the Body, for the preſervation of the Vital heat, and for the nouriſhment of each Part.

The inſides of the Ventricles.

The inſides of both the Ventricles are unequal or uneven and rugged, being hollowed into many furrows diſtinguiſhed by fleſhy Fibres, that the Bloud which comes into the Heart might be the more agitated in them, and thereby more intimately mixed with the Chyle and Air that come along with it, the firſt into the right Ventricle, and both into the left. From theſe fleſhy Fibres are nervous ones extended to the Valves, of which we ſhall diſcourſe by and by. They are more numerous and ſtronger in the left Ventricle than in the right, becauſe a ſtronger conſtriction was neceſſary for the former than for the latter, ſeeing from the former Bloud is ſent to all Parts of the Body, but from the latter to no greater diſtance than the Lungs, as was obſerved before. Theſe Fibres, Furrows and Valves you may ſee very well expreſt in the following Figure.

The ſeptum.

Theſe Ventricles are divided by a Wall called the *ſeptum* or partition, which is nothing elſe but the right wall of the left Ventricle; wherefore its right ſide is bunched, but the left hollow. On its left ſide it is furrowed and unequal as the reſt of the Ventricle is, but on the right it is well nigh ſmooth. It is a very ancient opinion, that there are a great many large pores or holes in this *ſeptum*, whereby the thinneſt and moſt ſpirituous part of the Bloud paſſes out of the right Ventricle into the left immediately, without taking that circuit through the Lungs that the reſt doth. They are ſaid to be wider on its right ſide, and going ſlanting to grow narrower towards the left. There are many Modern as well as Ancient Vouchers of this opinion: amongſt whom is *Bartholin*, who having enumerated ſeveral Anatomiſts that have affirmed to have ſeen them themſelves, ſays that he himſelf has ſeen the *ſeptum* of a Hog's Heart ſlantingly pervious in ſeveral places with great and manifeſt pores, ſo large as to admit a pretty big Peaſe, and lying open without a Probe, which being put into any one of them on the right ſide paſſed to the left Ventricle, where a thin Membrane did hang before the mouth of the Pore like an Anaſtomoſis (as he calls it, I ſuppoſe he means a Valve) which hindred the putting in the Probe on that ſide, and conſequently muſt have hindred the return of the Bloud out of the left Ventricle into the right when the Animal was living. And he thinks that the *ſeptum* is nouriſhed by the Bloud that paſſes through theſe Pores, ſeeing the Coronary Veins (above-deſcribed) run onely through the ſurface or outſide of the Heart. And

Its pores.

he will have not onely the more ſpirituous part of the Bloud, but the thinner part of the Chyle alſo to paſs through them. It would be *tedious* to recite all thoſe Authours that he quotes to ſecond him, as alſo his Apology for their often not-appearing in many dead Bodies, ſeeing there are many paſſages beſides theſe in Live-creatures, that there are no foot-ſteps of after they are dead: for as it ſeems not likely that the *ſeptum* ſhould be nouriſhed by bloud that paſſes ſo rapidly through theſe ſuppoſed holes; ſo by the carefulleſt examination of other skilfull Anatomiſts there have been no ſuch holes to be found, unleſs they were firſt made by the Probe; though indeed there are ſeveral pits that look as if they went through, which I believe to be onely framed for the greater agitation of the bloud in the Ventricle.

The internal Veſſels of the Heart.

In the foregoing Chapter we deſcribed thoſe Veſſels that may be called *external* from their running chiefly on the outſide of the Heart, (commonly named the Coronary) by which it is nouriſhed: but there are another ſort that may be termed *internal*, which are ſuch as open into and out of its Ventricles or inward *Sinus's*, but yield no nouriſhment to it. Theſe are four, the *Vena cava*, and pulmonary Artery; the pulmonary Vein, and great Artery.

Vena cava *and* vena Arterioſa *belong to the right Ventricle;*

Of theſe, the *Vena cava* or hollow Vein, and the *Vena Arterioſa* or pulmonary Artery do belong to the right Ventricle; the hollow Vein filling it with venal bloud returning from all Parts of the Body, which it receives in when the Heart is relaxed, which ſtate is called its *diaſtole*; and the pulmonary Artery carrying forth the ſaid bloud into the Lungs when the Heart is contracted, which ſtate of the Heart is called its *ſyſtole*.

Arteria venoſa *and* Aorta *to the left.*

To the left Ventricle do alſo belong two Veſſels, namely, *Arteria venoſa* or the pulmonary Vein, and *Aorta* or the great Artery. The pulmonary Vein within the ſubſtance of the Lungs doth receive the bloud from the pulmonary Artery, and pours it into the left Ventricle, there to kindle and ventilate the vital flame, and to perfect the arterial bloud and ſpirits. The great Artery is the trunk from which all other Arteries do branch, and through which the arterial bloud (after it is in this Ventricle perfected as aforeſaid) is diſperſed or thrown into all the Parts of the Body, for the life and nouriſhment thereof.

Three Valves to the Vena cava, *called* tricuſpides.

Now to each of theſe four Veſſels do belong *Valves*, for the better performance of their offices before ſpoken of. And firſt to the hollow Vein do belong three, which are of a triangular figure, and are from that figure called *treble-pointed* Valves. They are placed at the baſis or bottom of the Heart at the entrance of the ſaid Vein into the Heart, and do look from without inward, that ſo they may admit of the bloud's paſſing through them into the Heart, but ſuffer none to paſs out again that way.

Three alſo to the vena Arterioſa, *called* figmoidæ.

To the pulmonary Artery do alſo belong three Valves, which, contrary to the former, look from within outward, and from the reſemblance they have with the letter C, are called *Sigma*-faſhioned, the old Greek *Sigma* being of that ſhape. Theſe Valves as the former are placed at the baſis of the Heart, and at the entrance or rather outlet of the Ventricle. And their uſe is, to let the bloud, brought into this Ventricle by the hollow Vein, paſs again out of the ſaid Ventricle into the pulmonary Artery, to be carried by it into the Lungs; but they will not admit of any bloud to return from the Lungs into it.

To

To the pulmonary Vein do belong two Valves, which look from without inward, as the treble-pointed Valves do, and their uſe is to admit of the bloud brought out of the Lungs by the pulmonary Vein, into the left Ventricle, but they will ſuffer none to paſs by that Vein back to the Lungs again. Theſe, from the reſemblance they are ſaid to have with a Biſhop's Mitre, are called Mitre-ſhaped Valves. *Two to the* Arteria venoſa, *called* mitrales.

To the *Arteria magna* or great Artery do alſo belong three Valves, which go by the name of Semilunary or Half-moon-faſhioned Valves. Their uſe is to hinder any bloud from returning into the left Ventricle out of the great Artery; but they permit the Bloud to paſs by them out of the Heart into the ſaid Artery, from whence it is ſent by its ſeveral branches into all the Parts of the Body. *Three to the* Aorta, *called* ſemilunares.

Having ſpoken to the Ventricles, Veſſels and Valves of the Heart, we are in the next place come to treat of the two Appendices or Proceſſes which are placed at the bottom or baſis of it, and are called the *Ears* or *Earlets* of the Heart, from ſome reſemblance in ſhape which they have to the Ears of the Head. They are in number two, to each ſide of the Heart one, anſwerable to the number of the Ventricles. Of theſe, the right is larger, but ſofter; the left leſſer, but harder. The right is larger, becauſe the orifice of the hollow Vein belonging to the right Ventricle, is much bigger and larger than the orifice of the pulmonary Vein belonging to the left Ventricle. For it was not needfull that the Lung-vein ſhould be ſo large as the hollow Vein, ſeeing the bloud that it conducts to the left Ventricle is neither ſo much as that which is brought by the *cava* to the right, and beſides is thinner and more ſpirituous being impregnated with Air in the Lungs, and therefore paſſing more quickly needs the narrower channel. *The* auriculæ *of the Heart.*

The external part or *ſurface* of them, when full or extended, is ſmooth and bunching; but when empty, wrinkled. *Their ſurface.*

Their *ſubſtance* is peculiar, ſuch as is to be found in no other part, thin and ſoft that they might be the eaſilier contracted, and yet nervous and ſtrong, that they might endure that continual motion to which they are deſtin'd. Of the two, the left is the more compact, thick and fleſhy. On their inſide they have Fibres running from their baſis where they are joined to the Heart, towards their top where the Veins enter them, (ſuch as the Ventricles of the Heart themſelves have) by help whereof they contract themſelves in their *ſyſtole*, and ſqueeze the bloud contained in them, into the Ventricles. *Their ſubſtance.*

Theſe Ears or Earlets have (as the Heart it ſelf hath) two motions, firſt the *ſyſtole* or contractive, next the *diaſtole* or dilative motion. There is alſo betwixt theſe two motions (both in the Ears and Heart) a reſt or pauſe, eaſy to be diſcerned in ſick Horſes, or Horſes ready to die, but not ſo eaſy to be either diſcerned or felt in a ſound or healthfull Horſe; for in ſuch, the motions are performed ſo ſwiftly, that there ſeems to be an immediate paſſage from one to the other, without any intermiſſion or reſting between. This pauſe or reſt between the two motions, is called *periſyſtole*. *Their motion.*

The *ſyſtole* and *diaſtole* of both Earlets do happen at one and the ſame time; for when the right undergoes its *diaſtole*, then and at the very ſame inſtant the left undergoes the ſame. And they do the like in the *ſyſtole*. But though the Heart hath the ſame motions as theſe Earlets have, yet it doth not perform them when theſe do; for the *ſyſtole* of the Earlets happens at the ſame time with the *diaſtole* of the Ventricles; and on the

the contrary, the *ſyſtole* of the Ventricles, with the *diaſtole* of the Earlets.

Their uſe. Now the *uſe* of theſe Ears or Earlets is, to prevent the too violent ruſhing in of the bloud out of the *Cava* and Lung-vein into the Ventricles of the Heart, whereby both the Valves might have been violated, and the Vital faculty ſuffocated. For theſe receiving the bloud out of the ſaid Veins, do meaſure it as it were into the Heart, ſo much bloud diſtilling out of thoſe Veins into theſe Earlets in each of their *diaſtole's*, as can be conveniently rarefied and elaborated at one time in the Ventricles.

Table XVI.

Repreſenteth the Earlets, Ventricles and Valves of the Heart.

Figure I.

Shews the *Vena cava* with the right Ventricle diſſected, ſo as to ſhew the treble-pointed Valves.

A *Shews the orifice of the coronary Vein.*
B *The treble-pointed Valves, which admit of the bloud into the right Ventricle, but hinder its return back that way.*
CCC *The little Fibres which faſten the ends of the Valves to the ſubſtance of the Heart.*
D *The Ventricle cut long-ways, the better to ſhew the before-named Parts.*

Figure II.

Shews the right Ventricle of the Heart laid farther open, to ſhew the Valves of the pulmonary Artery.

A *Shews the Ventricle opened.*
BBB *The* Sigma-*faſhioned Valves of the pulmonary Artery, that let the bloud out of this Ventricle into the Lungs.*
CC *A Probe thruſt through the pulmonary Artery croſs the right Ventricle of the Heart.*

Figure III.

Shews the left Ventricle opened alſo long-ways to ſhew its Valves.

AA *The pulmonary Vein coming from the Lungs and bringing the bloud from thence, which it pours into the left Ventricle.*
BBB *The three Mitre-ſhaped Valves of the ſaid pulmonary Vein.*

Figure IV.

Fig. III.

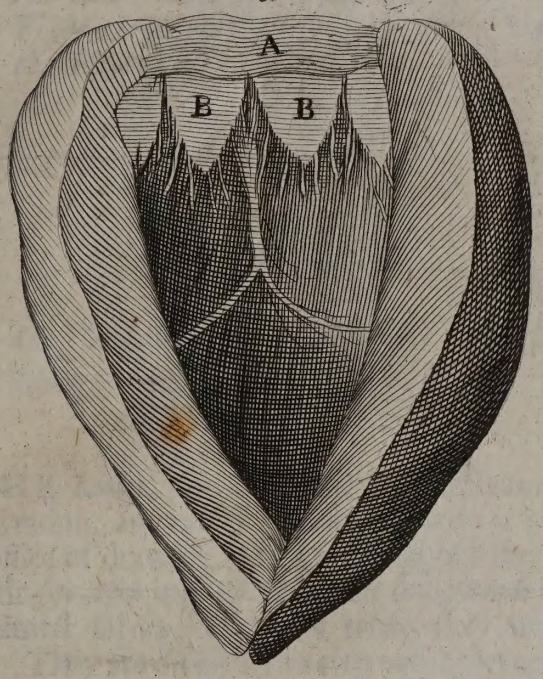


Fig. IIII.

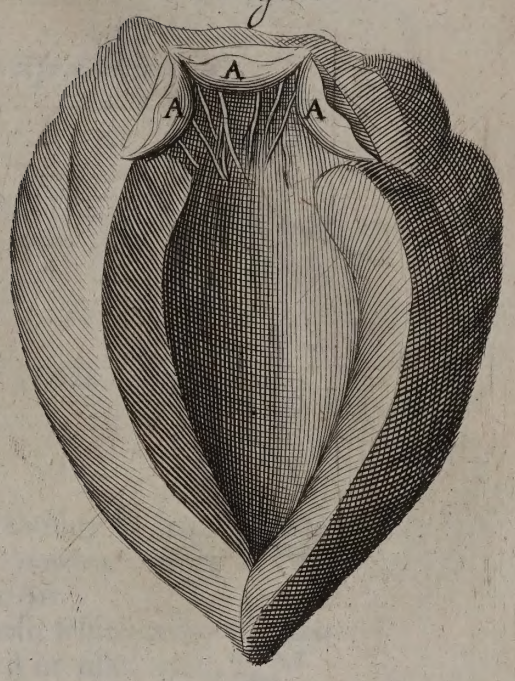


Fig. I.

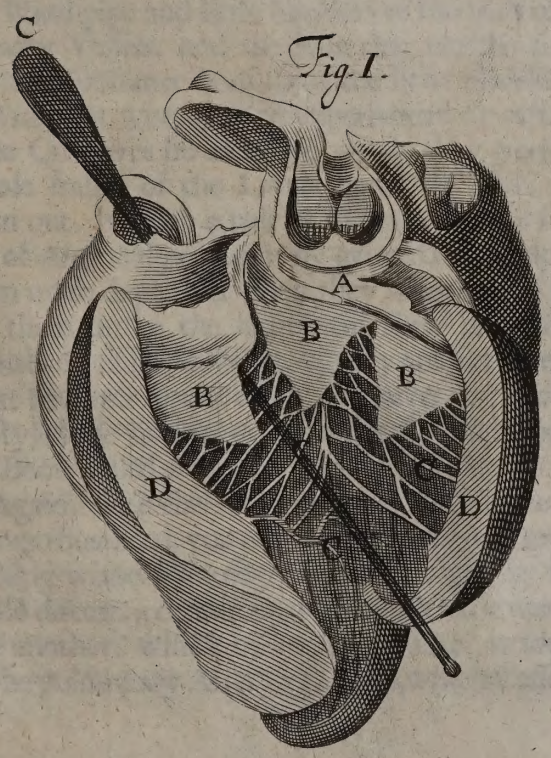
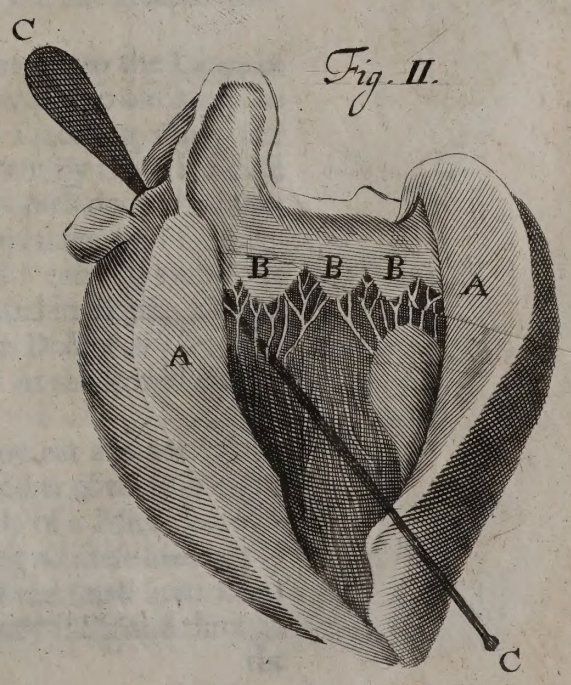


Fig. II.



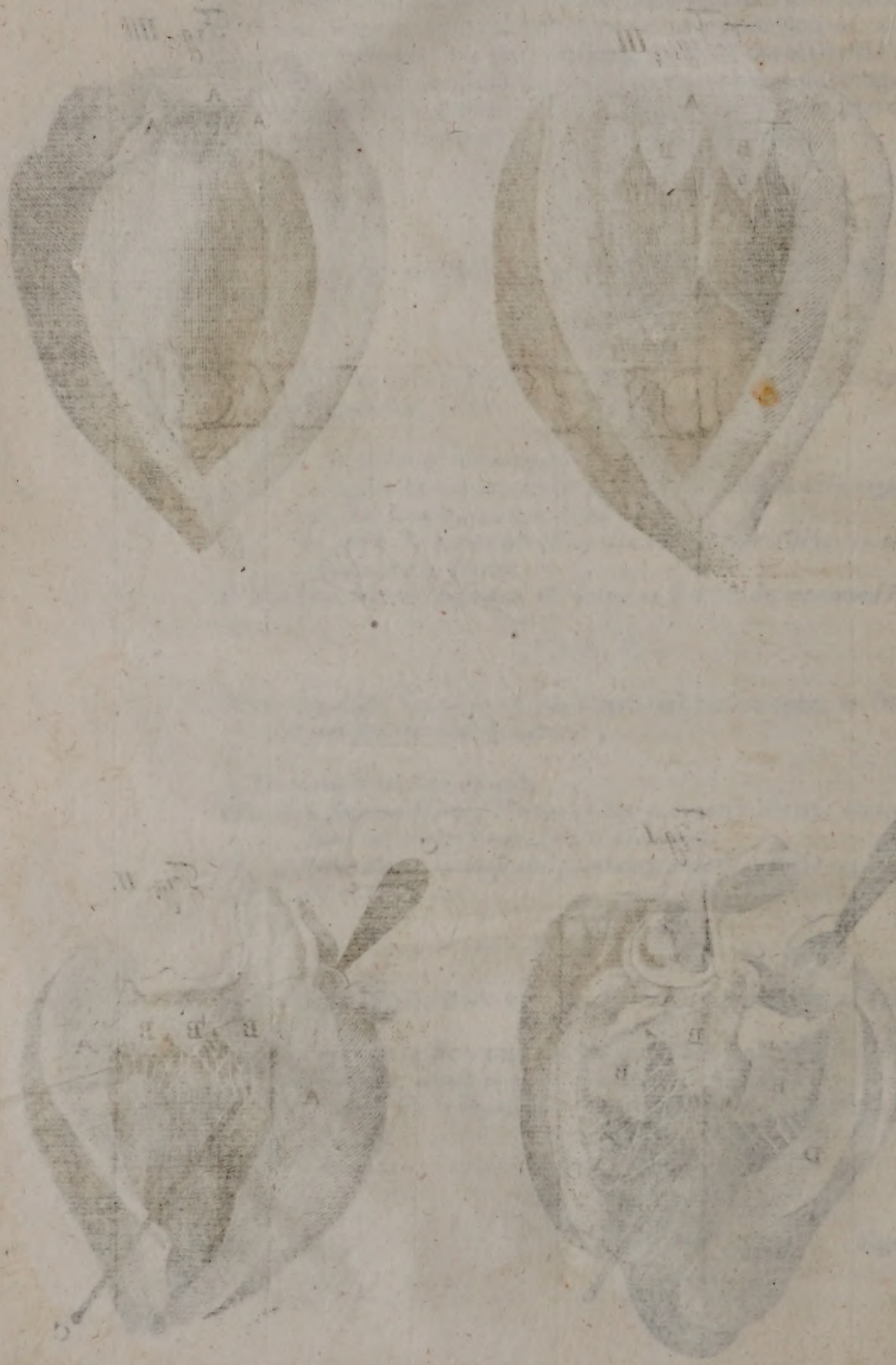


Figure IV.

Shews the great Artery cut aſunder near the Heart to ſhew its Valves.

AAA *The ſaid Valves of the* Aorta *or great Artery.*
BB *A Probe thruſt through the pulmonary Vein into the left Ventricle of the Heart.*

CHAP. IX.

Of the Organs of Breathing, and their Uſe; viz. *of the Lungs, and Wind-pipe.*

THE *Lungs*, which are the chief Inſtruments of breathing or reſpiration, are called in Latin *Pulmones*, in Greek *Pneumones*, from their office of drawing in and blowing out the Breath or Air. *The names of the Lungs.*

Their *ſituation* is in the cavity or hollowneſs of the Cheſt, which cavity they almoſt fill up; eſpecially when they are diſtended or filled with wind. They are divided into two equal parts called *Lobes*, one of which lies on the right ſide of the *Mediaſtinum*, or Partition-membrane of the Cheſt, and the other on the left. *Their ſituation and Lobes.*

Their *ſubſtance* hath hitherto been taken to be a *parenchyma* or fleſhy ſubſtance; but by the diligent ſearching into Nature of ſome of our Modern Authors, eſpecially of an Italian named *Malpighius*, they have been found of a contrary ſubſtance; for he affirms them to be excarnous or without fleſh, and merely membranous, made up of the branches of the Wind-pipe and little bladders at the ends of them, likewiſe of the pulmonary Veſſels, and the Skin that cloaths them. But the greateſt part of their ſubſtance conſiſts of the little bladders. *Their ſubſtance.*

This that worthy Man experienced by caſting Water into the Lungs of ſome Creatures he diſſected, while they were yet warm, ſo often till the whole frame of the Lungs appeared white; then ſqueezing the water clean out, he with a pair of Bellows or Pipe filled them by the Wind-pipe full of Air, and pent it in by tying the Windpipe; which done, he hung them up to dry; and when they were dried, he could diſcover (by holding them up to the light) the little bladders at the ends of each little branch of the Wind-pipe, as they are lively repreſented in Figures by that great Inquirer into Nature, the never to be forgotten Doctor *Willis*, juſtly ſtyled the honour of his Univerſity and Country, in the ſecond Part of his Book called *Pharmaceutice rationalis*. *See* Willis *Part* 2. *Sect.* 1. *cap.* 1. *of his* Pharmaceutice rationalis.

Again, ſaith the forementioned *Malpighius*, If you cut any part of the Lungs thus dried, you may very plainly ſee a great number of theſe bladders looking white. Moreover he affirms that by the help of a Microſcope he could diſcern a certain wonderfull Net as it were, tying all theſe bladders to one another, which he conceived to be made up of the ſmall branchings of the pulmonary Artery and Vein, which Veſſels convey the bloud through the

the ſlender and winding ducts, and through the manifold bendings of the Pipes. And beſides theſe Veſſels which make this Net, Doctor *Willis* ſaith that there are another ſort to be perceived in living Diſſections, which are called *Lympheducts*, and are diſperſed all over the Lungs. Of what nature and uſe theſe Veſſels are, we have ſhewn above in the Firſt Book, chap. 12. and ſhall do further by and by. And *laſtly*, he ſays there are abundance of twigs of *Nerves* diſtributed every-where through them. Onely one thing further is to be noted concerning the Veſſels of the Lungs from the ſaid Doctor's obſervation, that the Bloud-veſſels thereof are not onely branches of the pulmonary Artery and Vein, but alſo ſome proceed from the *Aorta* it ſelf; which ſhould ſeem to intimate that the Lungs are truly nouriſhed by theſe laſt, as are all other Parts of the Body, and that the bloud that comes to the Lungs from the right Ventricle of the Heart by the pulmonary Artery, and returns to the left by the pulmonary Vein, paſſes not this way for the nouriſhment of the Lungs, but onely that it may be impregnated with Air, without which as it wants of its perfection, ſo is it unfit and unable to preſerve the vital heat of any Part, or to contribute any nouriſhment to it. But this onely by the bye.

Table XVII.

Repreſenteth the Wind-pipe deſcending into the Lungs, as alſo the whole ſtructure of the Lungs placed as they lie in the Body, to ſhew their ſeveral Lobes, as alſo the *Lympheducts*, after Doctor *Willis*.

Figure I.

AA *Shew the ſubſtance of the Lungs.*
BB *The ſeveral Lobes.*
CC *The* Lympheducts.
DD *A portion of the* Aſpera Arteria *or Wind-pipe.*

Figure II.

AA *Shew the upper part of the Wind-pipe cut off.*
B *The* Cartilago ſcutiformis.
C *The* Glottis.
DDD *The ſeveral Griſtles that make the Wind-pipe.*
EEE *The Membranes betwixt each Cartilage or Griſtle, which make the other part of the Wind-pipe.*

Now the ſeveral things here named, of which the Lungs are compoſed or framed, do plainly ſhew their ſubſtance is not carnous or fleſhy, but merely fiſtulous, being compacted of Pipes of ſeveral kinds and magnitude, and variouſly and intricately diſpoſed; which Pipes we will particularly ſpeak to in order, and firſt of the chief of them, which is the Wind-pipe, called *Aſpera Arteria* the rough Artery.

The Wind-pipe. The *Aſpera Arteria* is a Pipe or Chanel which deſcends down the Neck beginning in the Throat at the root of the Tongue, and reaches as far as the Lungs, in which it diſperſes it ſelf into innumerable branches great and ſmall, which branches reach to all the extreme parts of their ſubſtance,

TAB. XVII.

Fig. 1.

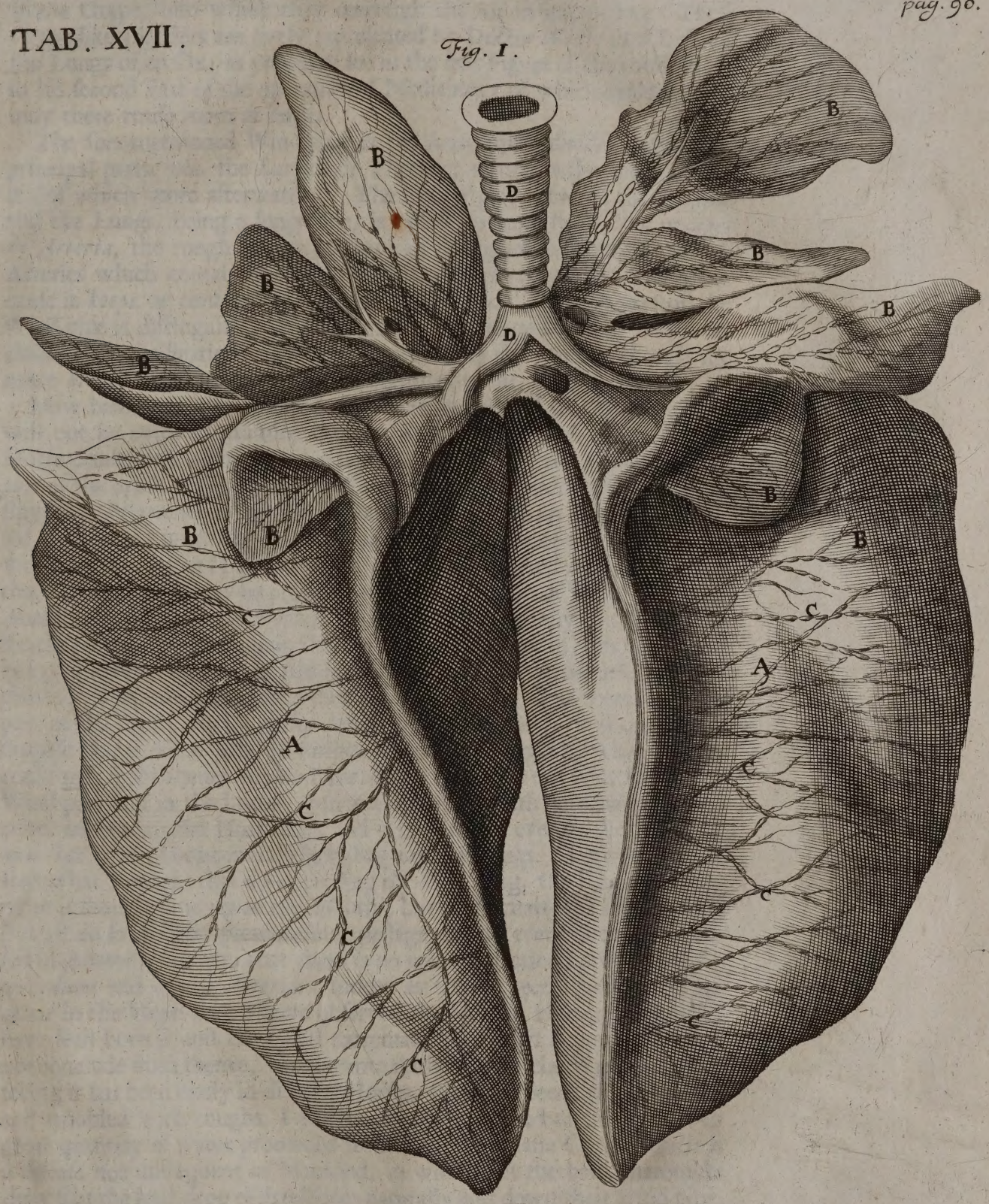
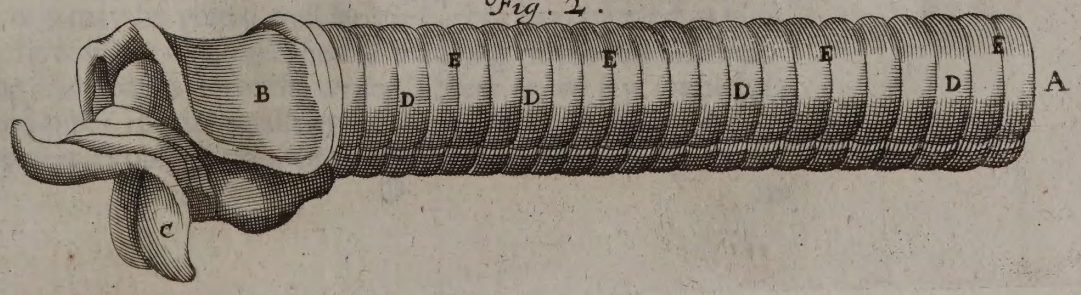
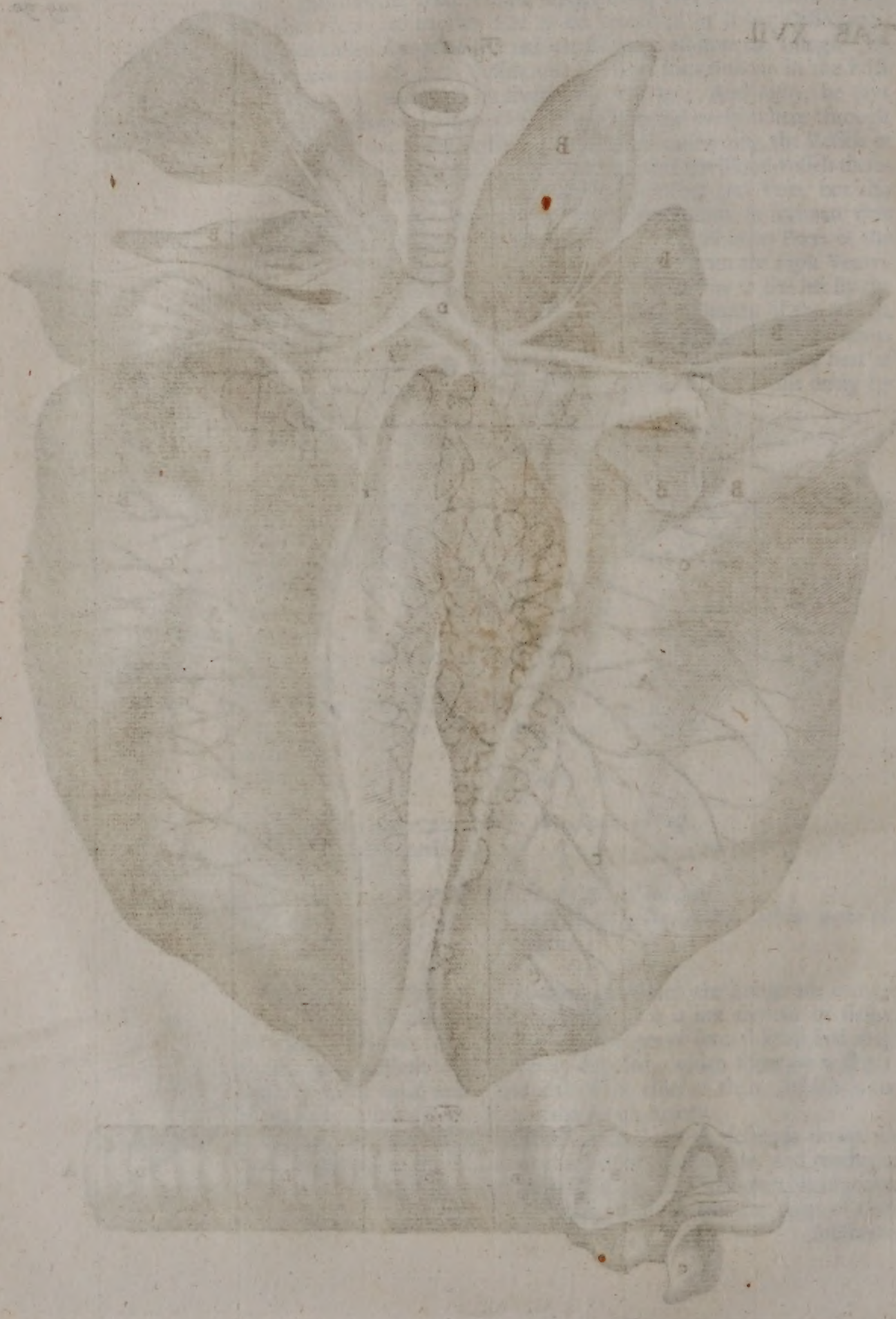


Fig. 2.





ſubſtance, and at laſt end in little bladders, each of them in reſemblance like a Grape, into which they conveigh the Air in inſpiration. Theſe Grape-like Bladders are lively repreſented by Doctor *Willis* in a Lobe of the Lungs of an Ox, as you may ſee in the firſt Figure of the third Table in his ſecond Part of the operation of Medicines; of which bladders you may there reade more at large.

Willis *Pharmaceut. Ration.* Part. 2. ſect. 1. cap. 1.

The fore-mentioned Wind-pipe is by Anatomiſts divided into three principal parts, *viz.* the *Larynx* or Throttle, which is the upper end of it (of which more afterwards.) The ſecond part between the *Larynx* and the Lungs, being a long Pipe, is called particularly *Trachea* or *aſpera Arteria*, the rough Artery; *rough*, to diſtinguiſh it from the *ſmooth* Arteries which contain the bloud and vital ſpirits; and an *Artery*, becauſe it *keeps* or contains *the Air* in reſpiration. The laſt part of the Wind-pipe is diſtinguiſh'd by the name of *bronchus* or *bronchia*, which includes the ramifications or branchings of it in the Lungs; though the name *bronchus* is ſometimes uſed to ſignify all of it.

The Parts of the Wind-pipe.

Now before we paſs on further to the deſcription of this Wind-pipe, it will not be amiſs to examine whether any part of the Liquors that an Horſe drinks paſs along it, or whether all go down the Gullet. That *part* of the drink glides down the Weazand was the opinion of the Ancient Phyſician *Hippocrates*, who experienced the ſame in an Hog newly killed, in whoſe Lungs was found a quantity of Liquor of the ſame colour with that which the Hog had drunk a little before. And *Bartholin* thinks that the ſame thing may be proved from an obſervation of *Julius Jaſolin* an Anatomiſt of the City of *Naples*, who ſeeking in the Body of a Noble Perſon the cauſe of his death, found his Heart-bag ſo filled with humour, that it being ſqueezed, ſome of the ſaid humour came out of his Mouth. But methinks it is an odd inference to conclude from hence, that therefore ſome part of the drink uſually paſſes down the Wind-pipe. For if one ſhould ſuppoſe that it did ſo paſs, it cannot eaſily be imagined by what ways it could paſs from thence to the Heart-bag; ſeeing all the branches of the Wind-pipe end in the Lungs, which are covered with a Membrane that never adheres to the Heart-bag, and very rarely if ever to the *Mediaſtinum* that comes between the Heart-bag and the Lungs. 'Tis true it ſeems ſomewhat ſtrange, that upon preſſing the Heart-bag, the liquor contained in it ſhould come up at the Mouth; but if the matter of fact be true, it muſt do ſo by ſome preternatural paſſage, ſeeing every one that is skilled in Anatomy knows, that there is no communication between the *Pericardium* and *aſpera Arteria*. Indeed as to the great quantity of humour in the Heart-bag, I have obſerved the ſame in Horſes, in which I have ſeen both it and the Cheſt extremely filled with liquor, but I dare not conclude from thence, that it came thither down the Wind-pipe; for ſeeing it has been onely in diſeaſed Horſes, that have been broken-winded and troubled with coughs, I am much rather inclined to think, that ſo great quantity of water proceeded from a Dropſie of the Cheſt, which is a diſeaſe not unfrequent in Mankind, in whom yet the beſt Anatomiſts deny that the leaſt drop of drink does naturally paſs down their Wind-pipe: of which any one may be pretty well ſatisfied, that has obſerved in himſelf or others, how when upon occaſion of laughing or the like in drinking, any of the drink paſſes down the wrong Throat as we ſay (which is down the Wind-pipe) the party falls preſently into a moſt violent cough. And as to *Hippocrates*'s obſervation, 'tis more likely the Hog's Lungs ſhould

Whether any part of the drink paſs by the Wind-pipe into the Lungs.

be tinctured by ſome preternatural and diſeaſed humour lodged in them, of a like colour to which his drink happened to be, than that they were tinctured by the drink it ſelf.

The coats of the Wind-pipe.

The Wind-pipe is covered with two coats or skins, one *outward* and the other *inward.*

The *outwardmoſt* is but of a reaſonable thickneſs, neither ſo thick nor ſo ſtrong as the other. It ſprings from the *pleura* or skin which inveſts the Ribs, and ſticks cloſe to the Ligaments of the Griſtles, yea does it ſelf ſerve to knit them more firmly one to another, and is a mean of connecting the whole Pipe more ſtrongly to its neighbouring Parts. It alſo uſhers along the Nerves of the Wind-pipe and Lungs.

The *innermoſt* is thicker and more ſolid than the former, in the Throttle eſpecially, whoſe inſide it covers, as alſo all the inſide of the Wind-pipe and its branches from thence to the bottom of the Lungs. It has two rows of Muſcular Fibres, the outer ſtreight, the inner ſlanting; the firſt ſerving to ſhorten the Wind-pipe, the latter to ſtraiten it. And one reaſon of the great ſtrength of this Membrane ſeems to be, that it might the better endure the violent motion of coughing without being injured. It is very ſenſible, and has its inſide beſmear'd uſually with a fattiſh or ſlimy humour, which likely is ſeparated in the Kernels of the Throat, and this ſerves to keep it moiſt and glib, that reſpiration may be performed with the greater eaſineſs and freedom.

The Griſtles which make the Wind-pipe.

Between theſe two coats or skins is the body or ſubſtance of the Wind-pipe, being partly of the nature of a Griſtle and partly of a Ligament; for it is made up of many round *Griſtles* like Rings, being pretty round on its fore-part, but on the back-part which is next to the Gullet a fourth part of the circle is wanting, in the room of which there is a thick, ſtrong and membranous ſubſtance, more ſoft than the Griſtles, that the Gullet which lies upon it on that ſide, might not be hurt by them.

Theſe Ring-faſhioned Griſtles are joined together by ſtrong Ligaments, which Ligaments do every-where keep the Griſtles at an equal diſtance one from the other.

Table XVIII.

Fig. I. Shews the lower part of the Wind-pipe with all its branches as they were ſpread through the Lungs, clearly ſeparated from all other Parts of the Lungs; to which branches are annexed all the bladders of Air, found out by *Malpighius* and here lively repreſented.

AA *Shew a portion of the* aſpera Arteria *or Wind-pipe.*
BBBB *Its diviſion into branches which run into the ſeveral Lobes of the Lungs.*
CCCC *The ſeveral extremities or ends of the ſaid branches.*
DDDDDD *The innumerable little bladders at the ends of thoſe branches.*
E *Shews where the Wind-pipe is cut off from the upper part of it.*
FFF *The ſeveral circular Griſtles which help to compoſe the Wind-pipe.*
GGG *The membranes or skins betwixt each Griſtle which are another part of the ſubſtance of the Wind-pipe.*

TAB XVIII

page. 92

Fig. 1.

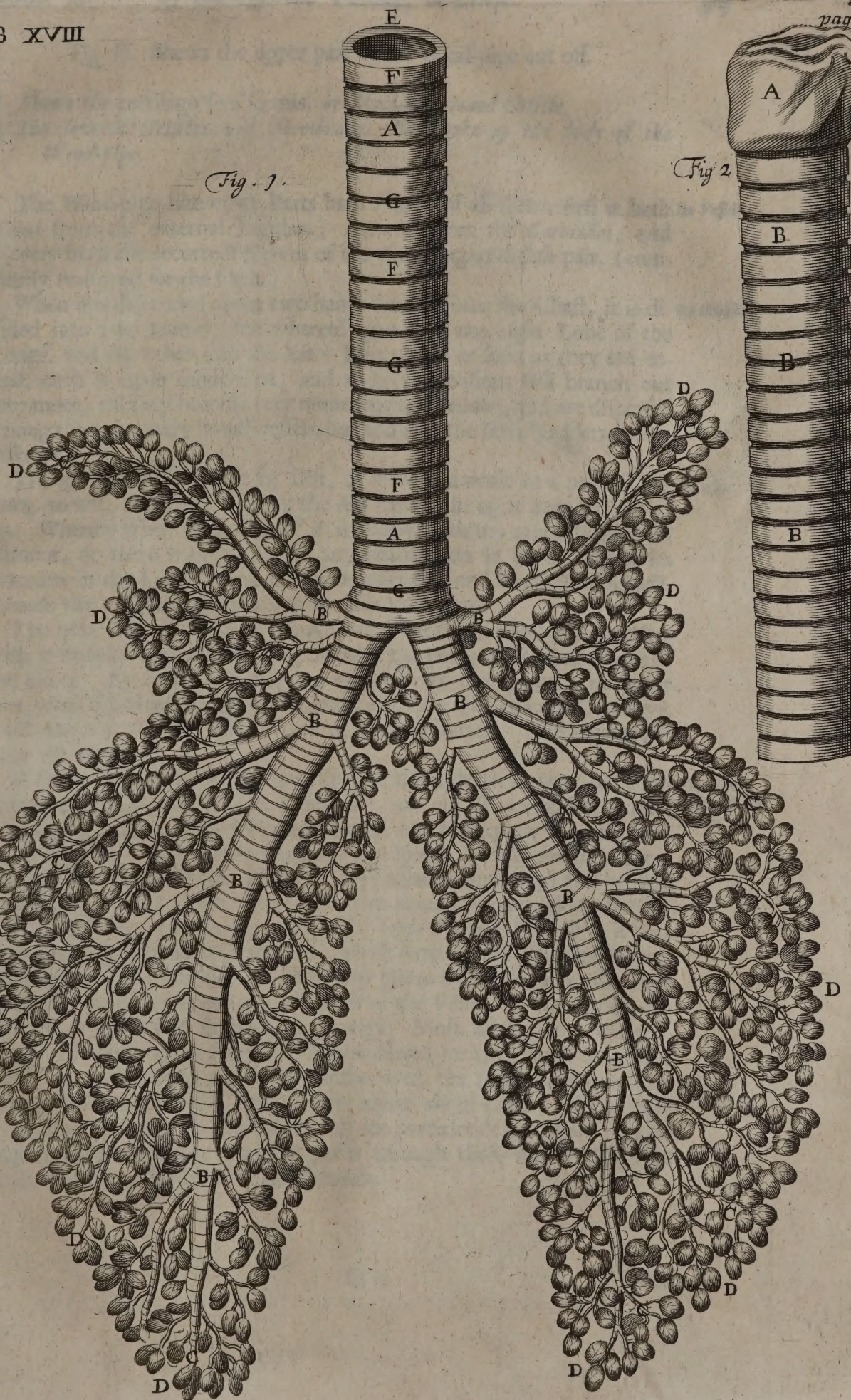
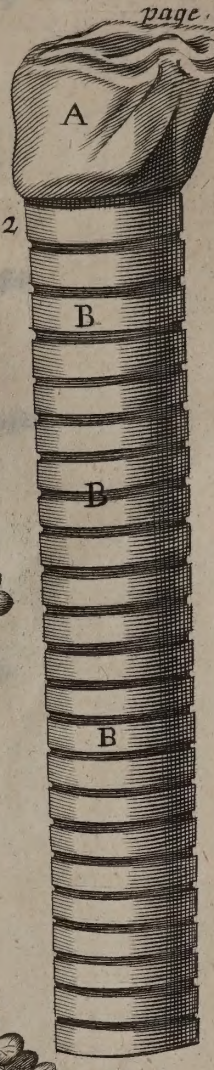


Fig. 2.



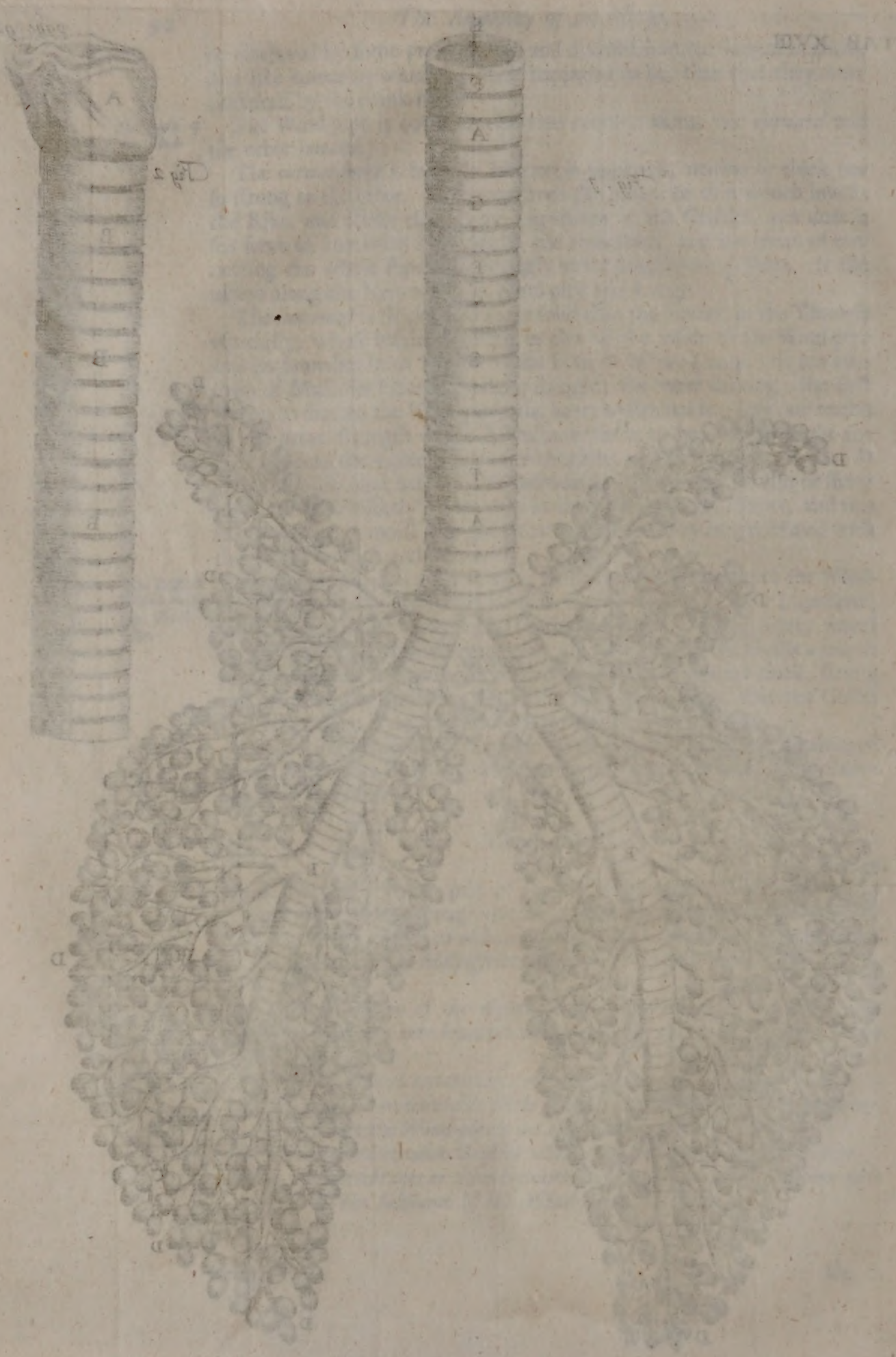


Fig. II. Shews the upper part of the Wind-pipe cut off.

A *Shews the* cartilago ſcutiformis, *or Shield-faſhioned Griſtle.*
B *The ſeveral Griſtles and Membranes that make up the body of the Wind-pipe.*

The Wind-pipe like other Parts hath *Veſſels* of all ſorts; firſt it hath *Veins* from the external Jugulars; *Arteries* from the *Carotides*; and *Nerves* from the recurrent Nerves of the wandring or eighth pair, (commonly reckoned for the ſixth.) *Its Veſſels.*

When it is deſcended about two hands-breadth into the Cheſt, it is divided into two trunks, one whereof goes into the right Lobe of the Lungs, and the other into the left. Into which as ſoon as they are entred, each is again ſubdivided, and thoſe ſubdiviſions ſtill branch out into more, till they become very numerous and ſlender, and are diſperſed among the pulmonary Bloud-veſſels, but end into the little bladders above-deſcribed. *Its diviſion.*

The *uſe* of the Wind-pipe is, firſt, to ſerve as a nozle to a pair of Bellows, to wit, that the Lungs by the Air entring in by it may be heaved up. Whence when the inſide of it is ſlabby with too much flegmatick humour, or there happens to be any obſtruction in it, or any of its branches in the Lungs, there follows a wheazing and ſhortneſs of breath, becauſe the Air has not a free ingreſs into the Lungs. *Its uſes.*

The next uſe of it is to let the Air out from the Lungs, and together with it ſmoaky vapours ſteaming through the pores of the Lungs out of the bloud. By help of it alſo, but eſpecially of the Throttle or upper part, does the Horſe neigh, or whinney as they call it in ſome Countrys, while the Air is driven forcibly out of it in expiration. And thus much as to the Wind-pipe.

A ſecond ſort of Veſſel or Pipe diſperſed through the Lungs, and compoſing a conſiderable part of their bulk, are the Bloud-veſſels, which are partly a branch from the great Artery, but principally the pulmonary Artery and Vein, whoſe branches are ſpread to and fro in a great number through its whole ſubſtance, and there complicated and twiſted with the branches of the Wind-pipe, the Artery running along the under ſide and the Vein the upper ſide of it, both cleaving ſo cloſe to it that they are not eaſily to be ſeparated. Theſe Arteries and Veins have communication one with another in ſeveral places by *anaſtomoſes*, the little twigs of the Arteries opening into thoſe of the Veins, for the readier circulation of the bloud through the Lungs. Moſt admirable is the contexture of theſe Veſſels about the Air-bladders; for their ſmall thred-like twigs are interwoven one with another with the moſt curious artifice (ſomewhat reſembling a Net) round about all of them; which moſt probably is ſo done, to the end that all the particles of the bloud may be impregnated with Air, while it paſſes through theſe fine Veſſels that twine about the Air-bladders on all hands. *The Bloud-veſſels of the Lungs.*

Table XIX.

Repreſenteth the pneumonick or pulmonary Artery and Vein cut off from the right and left Ventricles of the Heart, and alſo freed or ſeparated from the branches of the *bronchia* or Wind-pipe.

AA *Shew the pneumonick Artery cut off cloſe by the right Ventricle of the Heart.*

BB *The pneumonick Vein cut off from the left Ventricle of the Heart.*

CCCC *Their ſeveral branches accompanying the branches of the Wind-pipe from which they were pulled or torn, which are diſperſed through the whole ſubſtance of the Lungs.*

DDDD *The ends or extremities of all the ſaid branches which do end in the extreme parts of the Lungs, and which for their ſmallneſs are called capillary or hairy.*

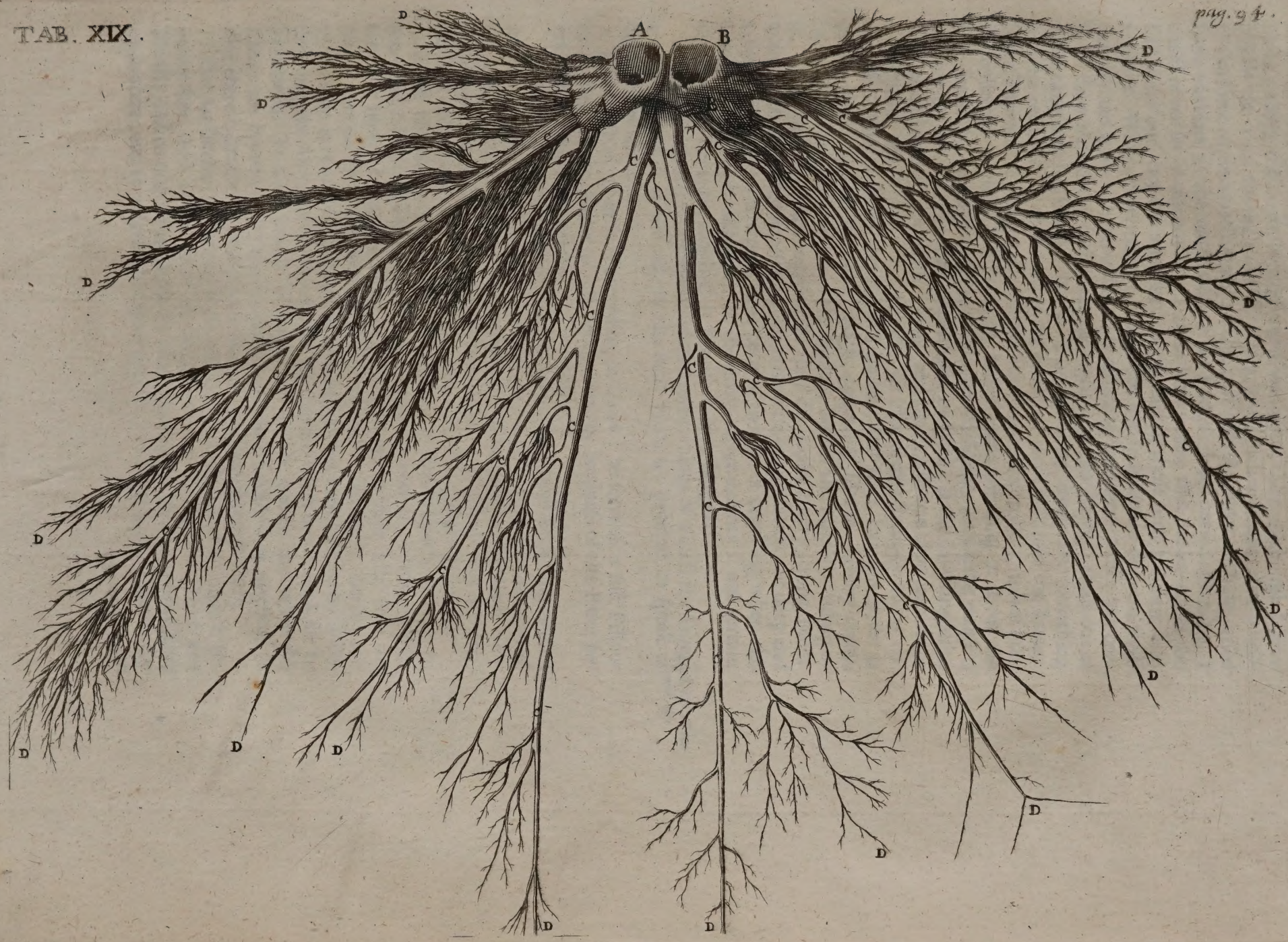
Their Lympheducts. A third ſort of Veſſel branching in the Lungs are the *Lympheducts*, ſo called from their office, which is to hold and convey a certain kind of water or humour called *Lympha*. Theſe Veſſels we deſcribed more fully in Book I. chap. 12. Here they wait on the Veins and Arteries through the whole ſurface of the Lungs, and receive the humour or water that they contain from them, being firſt ſeparated by the Glands; which humour ſeems to be a ſuperfluity of the bloud and it may be the nervous juice, which after they have received, they diſcharge into the thoracick duct, into which the greater branches of them are inſerted. Though theſe Veſſels be but ſlender, yet they are of great uſe and neceſſity; for as Doctor *Willis* affirms, if at any time any of the branches of them happen to be obſtructed or broken, there follows thereupon in Man a Dropſie of the Lungs and Breaſt, oft-times accompanied with Coughs or Phthiſicks: and this happens, becauſe by their being obſtructed or broken, the ſuperfluous humour which they like ſo many chanels uſe to contain or let paſs through them and carry off, is left behind, or diſtils into the Cheſt, which there breeds the fore-mentioned Diſtempers. Which opinion of his confirms me in my belief of the original of that watery humour in a Horſe, which I have very often in a plentifull manner found in his *Thorax* in diſſection, as I have above in this Chapter already ſaid.

Their Nerves. To theſe three ſorts of Veſſels a fourth is alſo added, which are the *Nerves*, with which they are well ſtored, having innumerable branches of them diſperſed through all their ſubſtance, accompanying the Bloud-veſſels and Pipes of the Wind-pipe; which Nerves do branch to them from the recurrent Nerves of the wandring pair.

Their inveſting Membrane. Now the Lungs being thus interwoven with theſe four ſorts of Veſſels, are covered with a ſtrong *skin*, or indeed two skins, for it is no hard matter to ſeparate it into two.

Theſe skins are furniſhed with very many pores or holes of an indifferent largeneſs, plain to be ſeen (ſaith *Bartholin*) if you blow up the Lungs with a pair of Bellows or Pipe. Which he doth not onely affirm that himſelf hath ſeen, but alſo quotes *Johannes Walæus*, who (ſaith he) hath obſerved them to be in Live-anatomies as large as to contain a pretty big Peaſe. Such pores, perhaps, there may be diſcernible in Live-anatomies, though whether ſo large as to receive a Peaſe I ſomewhat queſtion.

TAB. XIX.



queſtion. Indeed I had never my ſelf the opportunity of obſerving the Lungs in Creatures yet alive, but as ſoon as they have been dead, though I have made never ſo great haſte to take the Lungs out before they ſhould be any thing cold, yet I could never ſee any of them, although I have blown the wind through the Wind-pipe with ſuch violence, that I have broke ſome of the ſmall branches of it, and with the ſaid wind have raiſed little bladders in the outer skin of the Lungs; I ſay notwithſtanding, I could never ſee or diſcern any of theſe little pores, that did let any of the ſaid wind out, but the wind hath continued in thoſe little bladders ſeveral days. Which experiment I alledge not with a deſign to diſprove thoſe worthy and learned Anatomiſts, that affirm to have ſeen them; but onely to ſhew that if any ſuch there be, nothing paſſes through them out of the Lungs into the Cheſt. But now on the other hand, that ſomething may be received by them out of the cavity of the Cheſt into the Lungs, is not improbable; ſeeing one cannot imagine how corrupt purulent matter collected in the Cheſt from an Impoſthume breaking in it, or the like, ſhould by any other way get into the Wind-pipe, ſo as to be cough'd up, which it often is as well in Horſes as in Men. If the inveſting skins be removed in any part of the Lungs, and afterwards one blow into them through the Wind-pipe, then will the Air iſſue pretty ſtrongly out at the Breach. The outer of the skins is ſmooth and thin, but the inner is pretty thick, and on its inſide rough, appearing like an Honey-comb, by reaſon of the extremities of the Veſſels, and of the bladders ending at it. Both growing cloſe together as they do, make a very ſtrong Membrane, which is very neceſſary; for otherwiſe in anhelation, or deep and violent inſpiration, it would have been in danger of breaking when the Lungs are ſo much diſtended, to the great inconvenience if not certain death of the Creature to which it ſhould ſo have happened.

Having finiſhed the deſcription of the ſeveral things of which the Lungs are compounded or framed, in the next place we proceed to ſpeak of their *action* and *uſe*. *Their action and uſe.*

Their firſt *uſe* then is, (according to *Galen*) to ſerve as a ſoft Pillow or Bolſter for the Heart to reſt upon, that the hardneſs of the Parts behind them ſhould not offend it in its pulſation.

Secondly, They are the inſtruments of reſpiration or breathing, which is their proper *action*. Now reſpiration is performed by two motions of the Lungs, *viz.* dilatation and contraction. When they are dilated, they receive in Air, and this is termed *inſpiration*; but when they are contracted, they expel or drive forth the Air, which is called *expiration*.

While the Air is drawn in in inſpiration, a double benefit accrews to the Beaſt: Firſt his Heart and Bloud are thereby cooled; whence we ſee that the hotter he is, the more frequently he draws his breath, that the bloud may be the more fanned by the cool Air. Secondly, hereby the vital flame is continued; for as an ordinary Fire is extinguiſhed by withdrawing the Air from it, ſo does the Animal die when it is denied Air to breathe in. To theſe benefits of inſpiration may be added, that when the Lungs are heaved up by the Air drawn in, their ſubſtance is rarefied, ſo that there is granted a freer circulation of the bloud through them.

The Air having performed theſe offices, by its ſtay in the Lungs it becomes hot, and ſo can be of no further uſe for cooling the Heart and Bloud; and its nitrous particles are conſumed by the vital flame that feeds upon them, and therefore it becomes neceſſary to expel it, that there may

be room for new and freſh Air to be drawn in for the uſes aforeſaid. So that this drawing in and expelling the Air ſucceed one another by turns, and anſwer to the *ſyſtole* and *diaſtole* of the Heart; onely this motion of the Lungs is partly voluntary and partly natural, but that of the Heart wholly natural.

But neither is *expiration* or breathing forth without its particular uſes; for by it are vented or voided the ſmoaky or ſooty ſteams or excrements of the Heart and arterial Bloud, (which excrements are brought from the Heart through the pneumonick Artery with the bloud:) alſo the thin and thick excrements of the Lungs gathered in the branches of the Wind-pipe are by this motion of expiration, (heighten'd into a cough) brought into the one great trunk thereof, through which as through a Reed it is driven by the force of the Air up to the Mouth and Noſe, to be by them voided.

Of what nature the motion of the Lungs is, and by what Muſcles of the Breaſt it is aſſiſted, the Reader may inform himſelf in the fourth Chapter of this Book that treats of the Midriff, whoſe motion correſponds to this of the Lungs.

CHAP. X.

Of the Neck.

HAVING now finiſhed my Diſcourſe of the two Lower *Venters*, order of Diſſection requires that I ſhould aſcend to the third and uppermoſt *Venter*, and treat of the Head and Animal Faculty; but I will firſt ſpeak to thoſe Parts which lead me thither, and thoſe are the Parts of the *Neck*.

The *Neck* is called in Latin *Collum*, *à colle*, from an hillock; for it ariſeth out of the Body as an hill doth out of the reſt of the Earth.

It comprehends the diſtance between the Head and Breaſt, and its Parts are *containing*, or *contained*: as for the former, they are ſuch as are found in the other Parts of the Body; but

The contained Parts of the Neck. The Parts *contained* are peculiar to it ſelf, and are theſe: the Gullet, the Wind-pipe, the *Vertebræ*, or Joints of the Neck, and its Muſcles. Of theſe two latter we ſhall diſcourſe in the Fourth and Fifth Books; and of the two former, we treated of one in the Firſt Book, as belonging to the Stomach, and of the other in this as pertaining to the Lungs. But becauſe the uppermoſt parts of both theſe next to the Throat are diſtinguiſh'd from the reſt by peculiar names and have particular uſes, we ſhall treat of them in this Chapter. Now the top of the Wind-pipe is called *Larynx*, and of the Gullet, *Pharynx*.

Of the Larynx. The *Larynx* or Throttle is ſituated, as hath been ſaid, at the upper part of the Neck, adjoining to the root of the Tongue. It is in Humane Bodies the inſtrument of the Voice, and in whatſoever other Creatures, of that noiſe which they make, by what name ſoever it be diſtinguiſhed, as particularly of the *neighing* of an Horſe.

Its

TAB. XX.

Fig. 1.

Fig. 2.

Fig. 3.

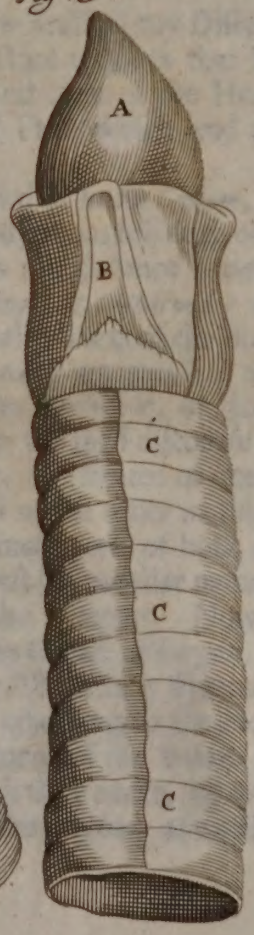


Fig. 4.

Its *figure* is round and almoſt circular, onely bunching a little out on the foreſide, and depreſſed as much on the back-part next to the Gullet, for the Gullets better and more ſecure paſſage, and that the meat in ſwallowing might not be hindred from deſcending by it. *Its figure.*

It is framed of five *Cartilages* or *Griſtles*, the firſt of which is called *Scutiformis* or Buckler-like, becauſe it reſembles a Shield or Buckler, being hollow within and bunching without. In Humane Bodies (in Men more eſpecially, for Women have it not ſo far ſticking out as Men) this bunching out is by ſome Anatomiſts termed *Adam*'s Apple, from an old Tradition that a part of the fatal Apple abode ſticking in *Adam*'s Throat in that place. *Its ſubſtance.* *Five* Cartilages.

The next or ſecond Griſtle of the *Larynx* is called *Annularis* from the reſemblance it hath to a Turkiſh Ring, wherewith they arm their Thumb when they ſhoot. This Griſtle is round, and incompaſſeth the whole *Larynx*.

The third and fourth, becauſe as they are joined together they reſemble the neck of an Ewer, are called *Guttales*. Theſe two Griſtles many times paſs for one, becauſe they have but one skin proper to them both, and untill that skin be removed they are not to be parted. Theſe two form the *glottis* or little tongue, being a chink of that ſhape.

The fifth is termed *Epiglottis* becauſe it is placed above the *glottis* or chink. The ſubſtance of this is ſoft, and its ſhape like an Ivy-leaf. Its uſe is to hinder the falling down of any thing that may be offenſive to the Wind-pipe, when the Creature doth ſwallow either his meat or drink.

Theſe Cartilages are moved by ſeveral pairs of *Muſcles*, which ſhall be deſcribed in the Fourth Book.

Table XX.

Repreſenteth the upper part of the Wind-pipe faſtned to the *os Hyoides*, as alſo to the root of the Tongue; likewiſe the *os Hyoides* it ſelf ſeparated from all other parts; it containeth alſo two other figures of the upper part of the Wind-pipe, to ſhew its ſeveral Parts.

Figure I.

Shews the upper part of the Wind-pipe, and the Parts to which it is faſten'd.

AAAA *Shew the Cartilages or Griſtles of the upper part of the Wind-pipe.*
BB *The head of the ſaid Wind-pipe faſtned to the* os Hyoides.
C *The Ligament that faſtneth the head to the ſaid bone.*
DDDD *The* os Hyoides.
EE *The bones that join with the* os Hyoides *at the bottom of the Head.*
FF *The Tongue.*

Figure

Figure II.

Shews the *os Hyoides* ſeparated from the Wind-pipe and from the Tongue.

AA *Shew the two long bones joined to the* os Hyoides, *whoſe other ends are faſtned (when in their places) to the bottom of the Head.*
BBB *The ſeveral cartilaginous bones that make up the* os Hyoides.

Figure III.

A *Shews the* Epiglottis *or Throat-flap turned more upon the upper ſide, the plainer to ſhew the back parts of it.*
B *The backſide of the* Scutiformis.
CCC *The Cartilages or Griſtles of the Wind-pipe.*

Figure IV.

Shews the upper part of the Wind-pipe with the Shield-faſhioned Griſtle and Throat-flap turned on one ſide to ſhew the ſides of thoſe Parts.

A *The* Epiglottis *or Throat-flap.*
B *The Shield-faſhioned Griſtle.*
C *A portion of the Wind-pipe.*

Its Veſſels. The *Veſſels* of the *Larynx* are of all ſorts. *Veins* are derived to it from the external Jugulars; *Arteries* from the large branch of the *Carotides*; Its *Nerves* it hath from the recurrent Nerves of the (eighth, commonly reckoned for the) ſixth pair, which are called in thoſe Creatures which have voices, *vocales.*

Its Kernels. There are alſo *two* ſorts of *Kernels* belonging to it. One pair is called *Tonſillæ*, which are placed at the ſides of the *Uvula*, and at the upper part of the *Larynx*. Theſe are thoſe which in Humane Bodies are called the *Almonds of the Ears*, and are of this uſe, *viz.* to ſeparate that flegmatick humour from the bloud that makes the ſlaver; which humour ſerves to moiſten it, and alſo the Gullet, that by their glibneſs or ſlipperineſs they may the better ſerve for their reſpective uſes.

The other pair of Kernels are placed contrary to the former, namely at the lower end of the *Larynx*, in number two, one on each ſide of the Buckler-like Griſtle. In Horſes they are much larger than the former, and by them large branches of the external jugular Veins and Arteries do run. Theſe are thoſe Kernels under the Throat or between the Jaws of an Horſe that one may plainly feel at any time, but more eſpecially when an Horſe has the Glanders, for in ſuch they are much ſwelled.

The

The *Pharynx* (or top of the Gullet) is ſo called from a Greek word that ſignifies *to carry*, becauſe it conveys the meat and drink from the Mouth toward the Stomach. It is ſomewhat more fleſhy than the reſt of the Gullet, and reaches up, *behind*, to the *Uvula*, on the *ſides* to the *Tonſils*, and on the *fore-part* to the *Epiglottis*. It has ſeveral Muſcles by the help of which it performs its motion, of which we ſhall treat in the Fourth Book. Its uſe is to receive the meat when it is chewed, and graſping it on every ſide by contracting it ſelf, to ſqueeze it down the Gullet, by which it deſcends to the Stomach. *The* Pharynx.

Thus much of the Parts of the *Neck*, which brings me to

The End of the Second Book.

The Pharynx (or top of the Gullet) is so called from a Greek word that signifies to carry, because it conveys the meat and drink from the Mouth toward the Stomach. It is somewhat more fleshy than the rest of the Gullet, and reaches up, behind, to the Uvula, on the sides to the Tonsils, and on the fore part to the Epiglottis. It has several Muscles by the help of which it performs its motion, of which we shall treat in the Fourth Book. Its use is to receive the meat when it is chewed, and gratping it on every side by contracting it self, to squeeze it down the Gullet, by which it descends to the Stomach.

Thus much of the Parts of the Neck, which brings me to

THE ANATOMY OF AN HORSE.

BOOK III.

Of the Head.

CHAP. I.

Of the Head and Animal Parts contained therein.

HAVING finiſhed the deſcription of the two Lower *Venters*, which are two of the principal Parts of the Body; I come now in the next place to betake my ſelf to the laſt principal Part which is the *Head*, being the ſeat of the Animal Faculty, as the two lower are of the Vital and Natural.

In diſſecting of this Part I ſhall follow the ſame method as in the two former, examining its Parts in order, as they offer themſelves to our ſight in diſſection, firſt dividing it into parts to that intent.

But before we begin to divide it, I think it will not be amiſs to ſpeak ſomething of its ſupereminency over all the other Parts; for in reſpect that it is the ſeat of the Senſes, it is lookt upon by Anatomiſts to be the chief Manſion-houſe of the Animal Soul; and Senſe is ſo neceſſary to every living Creature, that without it, it is not far from being without life. And as the Head in this regard is the moſt principal Part, ſo is it accordingly ſituated in the uppermoſt place, above all the other Parts of the

Body, for this reaſon, *viz.* that the Animal ſpirits as from a fountain might ſpring from thence, and communicate ſenſe and motion down to all Parts of the Body: but for the Eyes ſake more eſpecially has it this high ſituation, for thereby two conveniencies accrue to the ſenſe of ſeeing; firſt, the Eyes being placed as in a Watch-tower, can diſcover things at the greater diſtance, and thereby prevent many dangers which might otherwiſe come unawares: and in the next place by being placed ſo near the fountain of Animal ſpirits, the optick Nerves, which are of a ſoft ſubſtance, and could not therefore endure a long paſſage, are ſecured from breaking.

As to the *figure* or ſhape of the Head, I will omit ſpeaking of that, ſince it is ſo viſible and ſo common to be ſeen. And though ſomething might be ſpoken as to the true and moſt natural ſhape of an Horſe's Head, yet that being already deſcribed by other Authours, and may by me (if God ſhall ſo long ſpare my life) be treated of more at large in another Book which I deſign to ſet forth of the ſeveral Cures performed by me, by ſuch means and methods as I have experimented ſince I came to underſtand Anatomy; I ſhall wave it at this time, and ſpeak no more of the Head in general, but proceed to treat of its Parts.

The *Parts* of the Head, (as of the other two *Venters* before diſcourſed of) may be diſtinguiſhed into Parts *containing* and *contained*. The *containing* are either *common* or *proper*; of which in order.

The common containing Parts of the Head.

Firſt then of its *common containing* Parts; the firſt of which is the Cuticle with its hairs, of which we have ſufficiently treated in the firſt Chapter of the Firſt Book; the next is the *cutis* or True skin, alſo the Fat and fleſhy Pannicle, of all which we have treated at large in the five firſt Chapters of the Firſt Book, whither the Reader may pleaſe to turn back for his better information.

The proper containing Parts.

The *proper containing* Parts of the Head are five, namely the Muſcles, the *Pericranium*, the *Perioſteum*, the Skull, and the Membranes or *Meninges* contained within it.

The Muſcles.

To the *Muſcles* we will ſpeak in the next Book which is of the Muſcles, as being the moſt proper place.

The Pericranium.

The fleſhy Pannicle or *membrana carnoſa* together with the other common inveſting Parts above it being removed, the *Peritranium* next appears, which is a thin, white and very ſenſible Membrane ſpread over the whole Skull, adhering immediately to the *Perioſteum* every-where, ſaving where the temporal Muſcles on each ſide come between them. There are many ſlender Fibres that paſs from this Membrane through the ſutures or ſeams of the Skull, which are knit to the *craſſa meninx* or outer skin, which cloaths the Brain on the inſide of the Scull; whence ſome are of opinion that the *Pericranium* has its riſe from it. Whether that be ſo or no, theſe Fibres however ſerve to ſtay the *dura mater* in its place, whereby it hinders the Brain which it inveſts from being claſh'd againſt the ruggid Skull in violent concuſſions of the Head.

The Perioſteum.

The next inveſting Part is the *Perioſteum*, which is a Skin of much alike ſubſtance with the *Pericranium*, onely thinner. It is of the ſame nature with that Membrane that inveſts all the Bones in the whole Body, excepting the Teeth which are bare. From this Membrane it is that the Skull as well as all other bones are ſenſible, for of themſelves they are ſenſleſs Parts. It ſticks very cloſe to the Skull, and it, as well as the *Pericranium*, has *Arteries* from the external *Carotides*, and *Veins* from the external Jugulars.

We

We ſhould in the next place ſpeak to the Bones of the Head, or the ſeveral Bones of the Skull diſtinguiſhed by ſeveral ſutures; but I omit them alſo here, and ſhall ſpeak to them in their proper place, (*viz.* in the Fifth Book) and proceed to the Parts within the Skull, the firſt of which is the *dura meninx*, that is, the hard Skin or Membrane, called likewiſe *craſſa meninx*, to diſtinguiſh it from the *thinner* that lies next under it, and immediately cloaths the Brain.

Dura meninx.

This hard or thick Membrane is called by many Authours *dura mater* or the hard mother, becauſe they conceive that moſt of the Skins of the whole Body do ſpring from it, and therefore it is eſteemed as their mother.

Its connexion

Its *figure* and *amplitude* anſwer to the Bones of the Skull, by reaſon it inveſteth all its cavities. It is knit, and that very ſtrongly, to the bottom of the Skull, to its proceſſes, and to the circles of its holes, from whence it cannot eaſily be removed. It is ſuſpended alſo by the Fibres above-ſpoken of that come through the ſutures of the Skull from the *Pericranium*, as likewiſe by the Bloud-veſſels that penetrate the Skull and are inſerted into this Membrane. By which Veſſels it is in like manner faſtened to the Skin under it called the *pia mater*, and in ſeveral places to the Brain it ſelf. It conſiſts of two Skins, as the *Peritonæum* of the Loweſt *Venter*, and the *Pleura* of the middle do. In its upper part it is doubled, and its duplicature divides the Brain into two parts, the right and left. This duplicature being in the hinder part broad, and growing narrower ſtill as it inclines to the fore-part, I mean towards the Noſe, is by Phyſicians called *falx* or the ſickle, becauſe in a Man's Head which is pretty round, it makes almoſt an half circle, as a ſickle does. We may retain the ſame name for it in an Horſe, though leſs properly, as differing ſomewhat in ſhape.

The falx.

In this reduplication there are ſeveral cavities or hollowneſſes, commonly called by the Latin name *ſinus*, which are accounted receptacles of abounding bloud and ſpirits; by *Galen* they are called the Ventricles of the *dura mater*, by others ciſterns of bloud. The higheſt of theſe, and alſo the longeſt, doth run all along the top or upper part of the *falx* from the Noſe length-ways of the Head towards the Noll, where it is divided into ſeveral branches, two of which deſcend downwards to the bottom of the *occiput*, and a third runs to the *glandula pinealis*.

Its Sinus's.

Into theſe hollowneſſes or *ſinus's* the mouths of the Veins and Arteries are ſaid to open, the Arteries pouring bloud into them, and the Veins receiving it from them again, as hath been obſerved in the diſſecting the Heads of living Creatures, for in the long or uppermoſt *ſinus* hath been ſeen a ſtrong beating or pulſe occaſioned by the bloud that is diſcharged into it by the Arteries.

Tenuis meninx.

The other Membrane or Skin which inveſts the Brain is called *tenuis meninx* from its thinneſs, and *pia mater* or tender mother from its immediate covering or cloſe ſticking to the Brain, imbracing it as a Mother does her Infant. It is ſpread over all the cortical or outer part of the Brain, inſinuating it ſelf into all its windings, as alſo into thoſe of the *cerebellum* and *medulla oblongata*, and ties all their proceſſes and parts to one another, that they cannot be diſplaced or bear hard upon one another. And whereever it goes, the Bloud-veſſels run along it, and are diſperſed out of it into the Parts that it cloaths.

This Skin is very thin, and of a moſt exquiſite ſenſe, yea this and the *dura mater* ſeem to be the inſtruments of all ſenſation. For as ſenſe is commu-

communicated to every part immediately by the Nerves, ſo the nervous Fibres are more probably propagated from theſe Membranes that cloath the Nerves, than from the medullar Part it ſelf of the Nerve which is derived from the *medulla oblongata* and ſpinal marrow, which of themſelves have little or no ſenſe, but onely by virtue of theſe Membranes that inveſt them.

Its Veſſels. It is furniſhed with very many Arteries and Veins, moſt of which are exceeding ſmall, but in number infinite, interwoven one with another in the manner of a Net. The Arteries do ſpring from the *Carotides* and Cervical Arteries, and the Veins from the jugular Veins.

The uſe of the Meninges. The uſe of theſe two Membranes that inveſt the Brain is to ſuſtain the Veſſels that enter into it, to cloath and defend it from the hardneſs of the Parts that environ it, to keep it in its due form and ſituation (for of it ſelf it would run all about, it is of ſo ſoft a conſiſtency) and laſtly to afford a coat to all the Nerves, not onely to thoſe that ſpring within the Skull, but to all thoſe alſo that ariſe out of the Back-bone, for theſe two Membranes are propagated all along it, inveſting its pith, (called the ſpinal marrow) out of which thoſe Nerves ſpring.

CHAP. II.

Of the Brain in general.

The excellency of the Brain. BEING come to treat of the *Brain*, it ſhall not be amiſs, if before I ſpeak of its ſeveral Parts, I ſay ſomething as to its excellency, and the eminent offices it performs for the benefit of the Animal. All Authours agree that it is one of the moſt noble Parts of the whole Body, ranked for its dignity even with the Heart it ſelf. And indeed, as I have intimated in the foregoing Chapter, its ſituation ſheweth plainly as much, it being placed in the higheſt part of all the Body, and there fenced about as it were with ſtrong walls on every ſide, to ſecure it from outward injuries. In it are contained the Animal Faculties, *viz.* thoſe of Senſe and Motion. The former of theſe two Faculties ſits in it as in a Throne of Majeſty, beholding the forms of all things under her feet, having all the Organs and Inſtruments of the Senſes attending Her, at her command. For firſt the Eyes are placed near her, that as Spies or Centinels watching day and night they may diſcover the Enemy. The Ears alſo are ſeated near her, at her command to be turned this way or that way, to liſten to any dangers that are approaching, that ſo they may be avoided. Likewiſe the Inſtruments of Smelling and Taſting are near her, that at her command thoſe Foods that are profitable and neceſſary may be received, and that unpleaſant or hurtfull Food may be rejected. And as the Faculty of Senſation hath the forementioned Miniſters or Inſtruments placed near her for the execution of her offices; ſo hath the motive Faculty a dominion extended to the furtheſt limits of the Body, of which every Limb and Member is perfectly at her beck, to move this way or that way as ſhe directs. I ſay, both theſe noble Faculties have their ſeat in the Brain;

for

for it is not a private or particular Organ of Senſe, but an univerſal one; nor doth the motive Faculty exert it ſelf in the Brain it ſelf, which is incapable of *voluntary* motion; but that motion which it has, is *natural*, and that not owing to it ſelf, but to the Arteries that are diſperſed in it, for the beating of theſe makes it ſeem to widen, and contract it ſelf, as hath been obſerved in Wounds of the Heads of both Men and Beaſts. This motion, I ſay, is communicated to it from the Arteries, and in its dilatation it receives arterial bloud by the Carotid Arteries, and in its contraction it forces that Bloud into the Veins, and the Animal Spirits into the Nerves, by which they are carried into all Parts of the Body, and with them the moving power is imparted; for without ſuch influence from the brain an Animal would be like a Log, it would be able neither to move nor feel, or rather it would ceaſe to be an Animal, and become a dead Carcaſe.

That an Horſe hath a Brain.

How abſurd and ridiculous a thing is it then for any Man that hath any Brain himſelf, to imagine a Horſe to have none? yet ſuch Men I have my ſelf met withall, yea I know ſeveral which to this day will not be convinced of that erroneous opinion by any arguments whatever. Neither will they take the pains to inſpect the Parts, to ſatisfy themſelves of the contrary, but will ſtill continue in their falſe-received opinion, merely taken from a ſilly obſervation they have made when they have ſeen Horſes and Oxen knocked on the Head, where they ſee the Skull broken and nothing under it, but a few hard and dry Bones, without any marrowy ſubſtance: I ſay from this obſervation they draw their concluſion, that a Horſe hath no Brain. I much wonder how any ſuch Dolt can have the confidence to take upon him the name of a Farrier, and pretend to cure he knows not what. Such Perſons I would deſire onely when they ſee another Horſe knockt on the Head, that they prevail with them that doe it, (or otherwiſe when any Horſe is dead) to ſtrike him a blow or two with the ſame force above the uſual place betweeen the Ears or a very little lower, and they ſhall then be ſoon convinced that he hath a Brain, (though not ſo *large* by much as a Man hath, conſidering the different bulk of their Bodies.) And when they are convinced of that, I hope they will take pains to be ſatisfied in the other Parts of the Body by ſearching into them, as by theſe my Labours they are directed; ſo ſhall they improve themſelves in their profeſſions, and I have the wiſhed end of my pains, which I have taken to advance them.

CHAP.

CHAP. III.

Of the ſeveral Parts of the Brain, viz. *that which is ſtrictly called the Brain, the* Cerebellum *or After-brain, and the Spinal Marrow.*

The Parts of the Brain.

IF we take the *Brain* in a large ſignification, it comprehends all that marrowy ſubſtance that is found in the cavity of the Skull: yet for diſtinction's ſake it is by all Authours divided into three parts; firſt, the fore-part, being the largeſt, is called *the Brain*; ſecondly, the middle-part is called *Cerebellum,* the Brainlet or After-brain; and laſtly, the hindmoſt and lowermoſt is termed *Medulla oblongata,* being that part of the Spinal Marrow which is within the Skull.

The manner of ſawing the Skull aſunder.

Now to find out theſe ſeveral Parts we muſt divide the Skull with a Saw for that purpoſe, beginning almoſt as far back as the Noll-bone, or indeed quite as far, dividing the hole of the Noll-bone in the middle, and ſo go with your Saw firſt along one ſide of the Head a little above the auditory paſſage till you come to the Fore-head a little below the Eyes (or juſt even with them;) where being come, and having ſawed onely juſt through the Skull, (for you muſt have a care that your Saw do not pierce the Brain, for that will hinder your ſeeing the Parts of it) then croſs the Fore-head with your Saw and paſs along the other ſide till you come to the hole of the Noll-bone again: by doing which you will looſen the upper part of the Skull, which with care you muſt take off, that you break not the *dura mater* or Skin next under it, for that Skin is faſtened to it in ſeveral places. When you have removed that piece of the Skull, then remove the Skin alſo by parting it lengthways down the middle, whereby you ſhall plainly ſee the Brain with its convolutions or folds, alſo the After-brain with its wormlike proceſſes, *&c.* in ſuch manner as they are repreſented in the following Table.

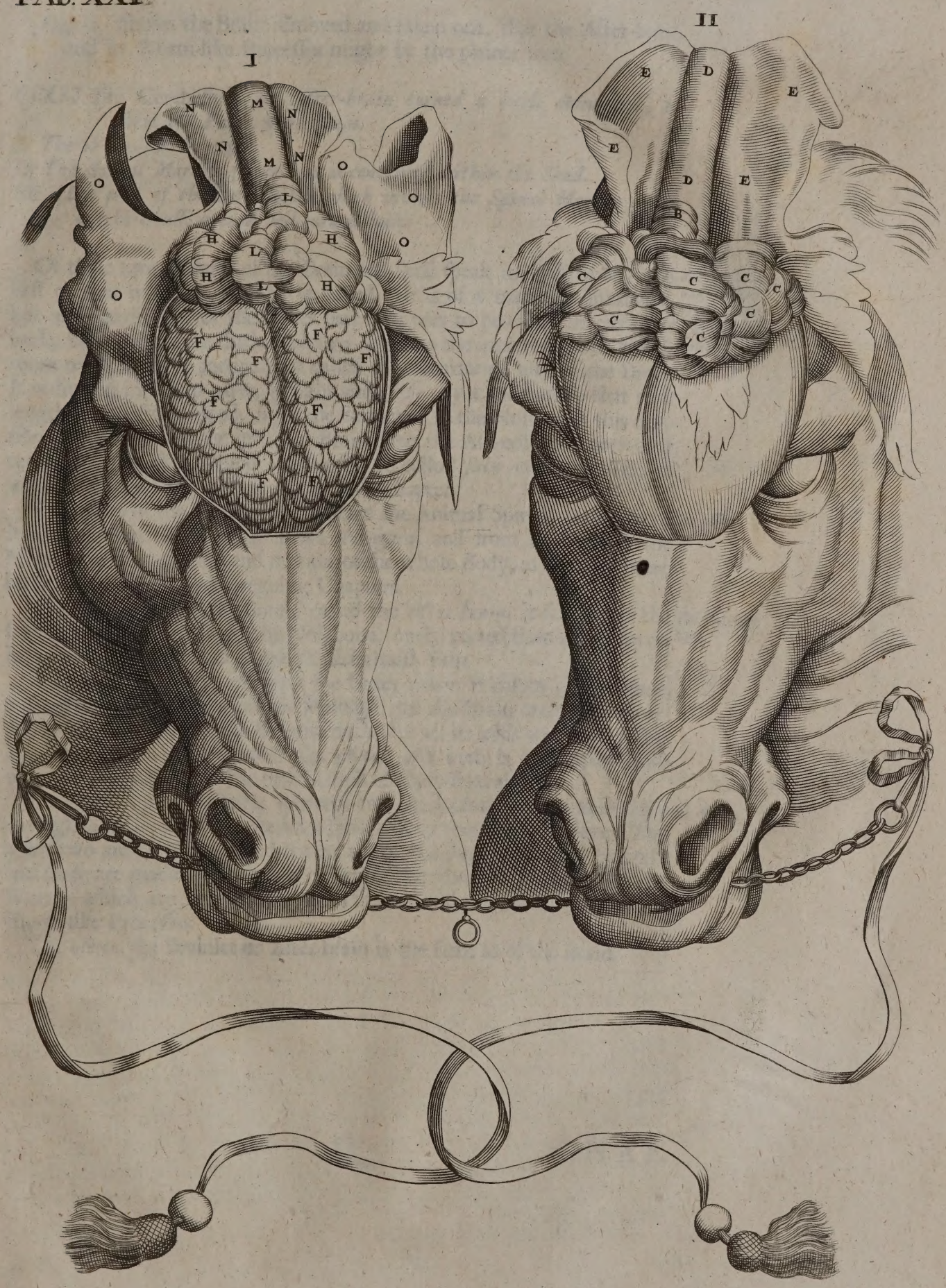
Table XXI.

Fig. I. Shews the Skull of an Horſe ſawed aſunder in ſuch a manner as that the Parts of the Brain may be ſeen in their natural ſituation.

FF *Shew the ſubſtance of the Brain covered with the* pia mater *onely, the* dura mater *being removed for that purpoſe.*
HH *The* Cerebellum *or After-brain alſo in its natural ſituation.*
LL *The* proceſſus vermiformes *or worm-like Proceſſes.*
MM *A portion of the* medulla oblongata.
NN *The* dura mater *ſo far as it contains the* medulla oblonatag, *cut in ſunder and turned back.*
OO *The Noll-bone cut in ſunder.*

Fig. II.

TAB. XXI.



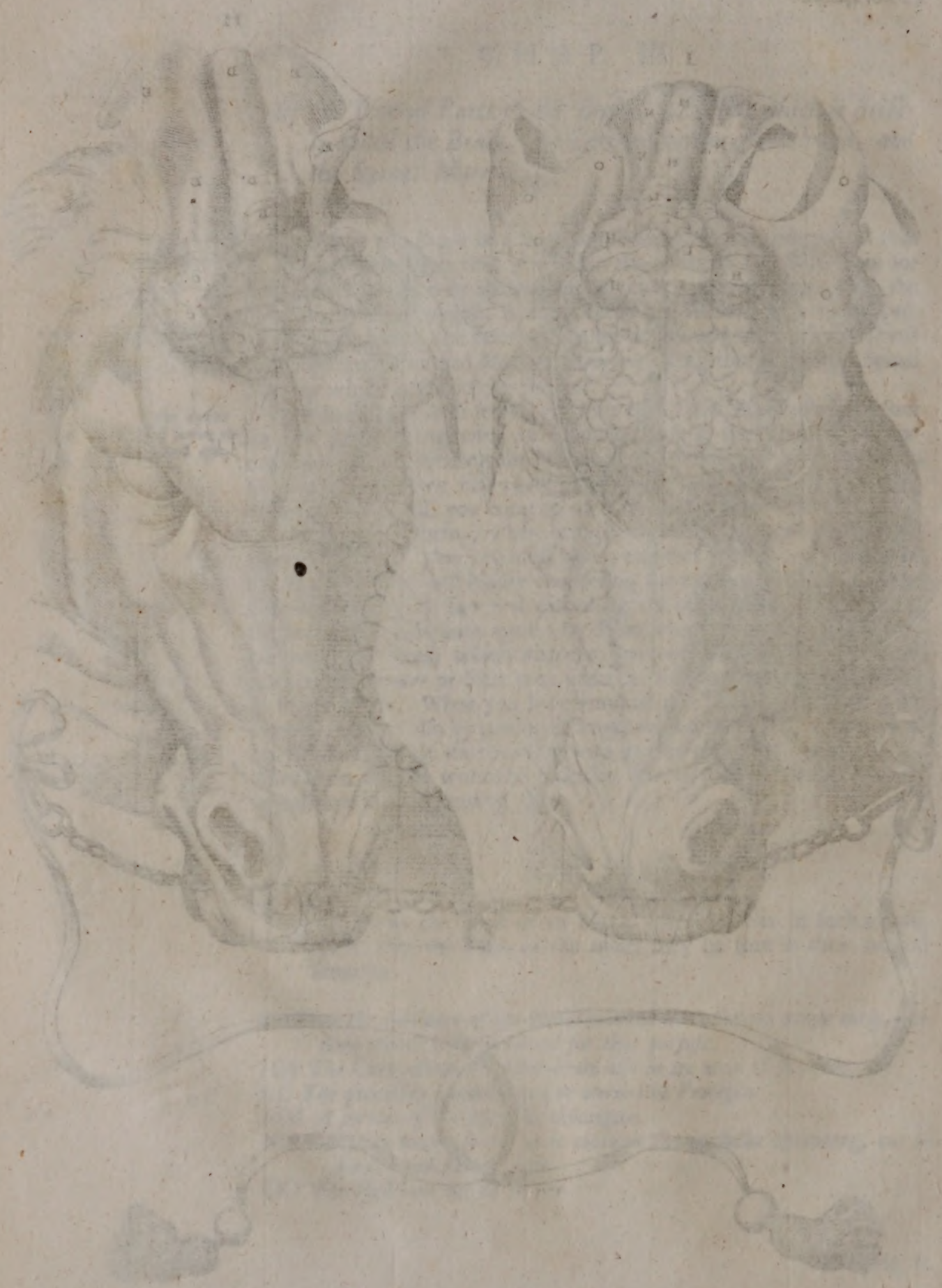


Fig. II. Shews the Brain removed and taken out, that the After-brain and its Worm-like Proceſſes might be the plainer ſeen.

CCCC *The* Cerebellum *or After-brain turned a little downward, to ſhew its Parts more plain.*
B *The Wormlike Proceſſes.*
D *The Spinal Marrow ſo much as is contained within the Skull.*
EE *That part of the* dura mater *which inveſts the Spinal Marrow within the Skull, opened and turned back.*

Of theſe ſeveral Parts of the Brain we ſhall ſpeak in their order, and firſt of that which is ſtrictly ſo called. It is of a marrowy ſubſtance, but not equally ſo, for the upper part of it uſes to be called its *cortex* or bark, being of a more dusky colour; whereas the inner or lower part is more white, and is particularly called the marrow or pith of the Brain. It is divided into two parts, a right and a left, by a Membrane that runs length-ways of the Head, from the Fore-head to the Noll; but this diviſion deſcends no deeper into the Brain than the Aſh-coloured part of it reaches. The Skin which divides it, is called *falx* or the ſickle, of which I have already ſpoken in the firſt Chapter. *The ſubſtance and diviſion of the Brain, (ſtrictly ſo called.)*

The *action* of the Brain is to elaborate the Animal Spirits, which from it are tranſmitted to the *Medulla oblongata*, and from thence into the Nerves, for the ſenſation and motion of the whole Body, as has been more fully ſhewn in the two foregoing Chapters. *Its action.*

The ſecond part of the Brain, called the *After-brain*, is ſituated in the back-part of the Skull next the Noll-bone, onely parted from the Brain on its upper part by the *pia mater* or undermoſt Skin. *The* Cerebellum.

This differeth not much from the Brain either in colour or ſubſtance, but onely in its convolutions or foldings: for the Brain obſerveth no order in its winding, but the Brainlet doth, for all its folds are circular, being extended one over another like plates, and each is kept apart from other by the *pia mater* that inveſts each of them ſeverally.

It is framed of four Parts, whereof two are lateral, (or on each ſide) the right and the left; and theſe are ſpherical, or round like a Globe: The other two are in the middle betwixt theſe, ſtanding before and behind; and theſe are made up of ſeveral orbicular Portions in ſimilitude like the Worms which are found in rotten Timber, and are from thence called Worm-like Proceſſes. *Its Parts.*

The *uſe* of the Brainlet or After-brain is the ſame as of the Brain.

CHAP. IV.

Of the Spinal Marrow contained within and without the Skull.

The Spinal Marrow. Its ſubſtance. THAT part of the Spinal Marrow that is within the Brain, is termed particularly *medulla oblongata*, and is the third part of the Brain, being of an uniform, white and compact ſubſtance, ſomething harder than either the Brain or After-brain.

Its riſe. It *ariſes* out of the Brain and Brainlet, and that from ſix roots; two of which ſpring at the upper and fore-part of the Brain, and are called *corpora ſtriata*, the ſtreaked or chamfered Bodies, being onely the ends of its two Thighs; the other four ariſe lower and more backward, by which it adheres to the Brainlet, and are thoſe protuberances or jettings out that are called *Nates* and *Teſtes*, its Buttocks and Teſticles.

Its figure. Its *figure* (after its riſe) is long and round, being thicker near its beginning than afterwards. Its length within the Skull is about two inches, beginning towards the fore-part of the Head, and reaching to the Noll, whence it is lengthned and continued down the Chine as far as the Dock. That part of it which is contained in the Chine, we commonly call in Horſes the pith of the Back.

Its Membranes. Within the Skull it is clad onely with two *Membranes*; but without, it is covered with three. The firſt of which it hath from the inner Skin of the Brain or *pia mater*; this immediately covers it. The ſecond it hath from the upper Skin of the Brain or *dura mater*; this is next to and covereth the former. And the third is ſaid to ſpring from a ſtrong Ligament which binds together the fore-part of the Rack-bones, covering both the former, and is very ſtrong.

Its uſe. Now the *uſe* of the Spinal Marrow is to be the original of all the Nerves, which from it (as from a Fountain) like ſmall Rivulets convey to all Parts of the Body the Animal Spirits. For although the Brain in common ſpeech be accounted the original of the Nerves; that is to be underſtood in a large ſenſe, when all the three Parts of the Brain are included in that one general appellation: But when the Brain comes to be divided into Parts, which are diſtinguiſh'd by particular names, then are both the Brain and Brainlet thrown out of the office of being the original of the Nerves. For ocular Inſpection doth teſtify, that it is from that part of the Spinal Marrow contained within the Skull, from which all the Nerves of the Brain do ſpring; as likewiſe from that part of the Spinal Marrow without the Skull, called the Pith or Marrow of the Back, that all the other Nerves of the whole Body do ariſe. Which large and far diſtant origination of the Nerves is very neceſſary; for it would not have been ſafe (in conſideration of the length of the way) that all the Nerves ſhould be carried from the Brain to the inferior or lower Parts; and therefore it is wiſely provided by Nature, that from the Marrow or Pith of the back thoſe Nerves ſhould ſpring which furniſh the Parts ſo remote from the Brain.

As

As for the *number* of Nerves which ſpring from the Spinal Marrow without the Skull, they are in a Horſe thirty ſeven pair, according to the number of Joints or *vertebræ* from the Noll-bone or the going out of the Marrow from the head, to the ſetting on of the tail; for out of the holes or perforations in every Bone do paſs a pair of Nerves. Therefore there being ſo many Bones, there are ſo many pair of Nerves that ſpring from the Spinal Marrow. And from the *medulla oblongata* or that part of the Spinal Marrow that is within the Skull, there ſpring nine pair, as ſhall be further ſhewed hereafter.

The number of Nerves ſpringing from it.

CHAP. V.

Of the Parts of the Cerebrum, *or Brain properly ſo called, viz. the* Rete mirabile, Glandula pituitaria, Infundibulum, *the Ventricles of the Brain, the* Corpus calloſum, plexus choroides, Nates, Teſtes, Penis *or* Glandula pinealis.

HAVING given a ſhort deſcription of the *Cerebrum*, (or Brain properly ſo called) the *Cerebellum*, and Spinal Marrow; we now return to the *Cerebrum*, to take a more exact view of its ſeveral Parts; and we ſhall begin with the *Rete mirabile* or wonderfull Net.

This Net is framed of innumerable twigs of Arteries which ſpring from the largeſt branches of the Carotid and Cervical Arteries, which paſs into the Skull by proper holes in the Bones of the Temples. This Net is far more diſcernable in Oxen and Horſes than in other leſſer Animals.

The Rete mirabile.

It is called *the wonderfull Net* by reaſon of its ſtructure, the Arteries of which it is compoſed croſſing one another like the threds of a Net, or rather as if ſeveral Nets were ſpread one over another. It is diſperſed all over the bottom of the Brain both without and within the *dura mater*, ſome of the ſmalleſt ſhoots of it branching into the pituitary Glandule.

Why ſo called.

The *uſe* of this Net is ſaid to be for the preparing of the Bloud and Vital Spirits to make Animal Spirits of. For which purpoſe in the twinings and windings of theſe ſmall Veſſels they are a long time detained, for the better elaboration and preparation of them, and leſt they might ruſh into the Brain in too full a ſtream, and thereby overflow and diſturb the Animal Faculty.

Its uſe.

To ſee this wonderfull Net, as alſo the other Parts of the bottom or under-ſide of the Brain, you muſt (after having ſawn the Skull aſunder, as is ſhewed in the foregoing Chapter) with a pair of ſharp Pincers pinch off by little and little the ſides of the remaining part of the Skull, all round, untill you come as near the bottom as you can; and you muſt then with as much care as poſſible lift up the Brain, beginning at the fore-part of it, where the Bone of the Fore-head a little ſeparates it. After you have lifted it a little way up, there will come in ſight the mammillary Proceſſes together with their nervous Filaments or Threds that

The manner of taking out the Brain, and in what order the Parts appear.

paſs through the Sieve-like Bone, hanging at them; which being looſened and the Brain farther pulled up, the next thing that appeareth are the branches of the Carotid Arteries, which having penetrated the Skull are carried to the Brain; which being cut off and the Brain yet a little farther turned up, the unition or coming together, and the going out of the Optick Nerves are to be ſeen; the Trunks of which if you likewiſe cut off, there are other Arteries (alſo branches of the *Carotides*) to be ſeen, coming in through the Bones of the Temples: which Arteries (as I have already ſhewed) are (with ſome ſmall Veins joined with them) thoſe Veſſels which make up the *Rete mirabile* or wonderfull Net, diſcourſed of at the beginning of this Chapter.

After you have cut in ſunder theſe Arteries alſo, then you may by lifting up the Brain ſtill a little higher, perceive the moving Nerves of the Eyes (for *they* come next to view) and after them the other pairs of Nerves follow in order, in ſuch ſort, that one pair of them being cut off and the Brain with its Appendices or Proceſſes more lifted up, the next is ſtill more plainly diſcerned by the carefull Anatomiſt. In which method and order all the Nerves, to which I ſhall particularly ſpeak in a convenient place, (I mean the Nerves ariſing within the Skull) and alſo the Arteries, as well the Carotid as Vertebral, being at length cut off, the whole frame of the Brain may be taken out of the Skull.

Table XXII.

Repreſenteth two Skulls, the one to ſhew the baſis or bottom of the Brain and the Head of the Spinal Marrow contained within the Skull, with the riſe of the Nerves from it; and the other ſhews the cavity of the Skull in which the Brain was ſeated, but now removed, the better to ſhew the *Glandula pituitaria* and other Parts that lie under the Brain.

Figure I.

Shews the bottom of the Brain and Spinal Marrow.

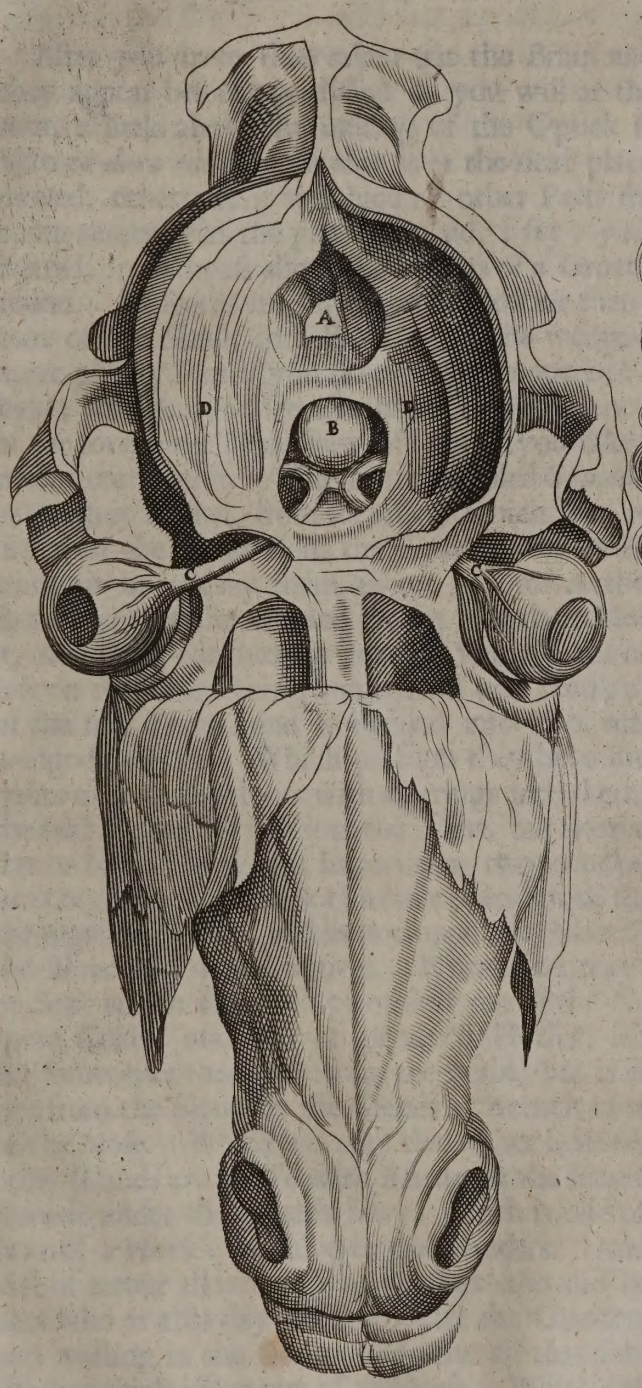
AA *Shew the Eyes.*
BB *The Optick Nerves.*
CC *The moving Nerves of the Eyes.*
DD *The fourth pair of Nerves, by Doctor* Willis *called the Pathetick Nerves, proper to one of the Muſcles of the Eyes onely, by which the Eye is chiefly moved in the Paſſions of Love, Anger,* &c.
EEEE *Several other Nerves ariſing from the Spinal Marrow within the Skull.*
FFFF *The bottom of the Brain.*
GG *The Spinal Marrow called here* medulla oblongata.
HH *The Spinal Marrow cut off at its going out of the Skull.*
IIII *The ſeveral barrs of the Palate of the Mouth.*
qq *The cavity or hollowneſs that goes from the Palate of the Mouth to the Noſe.*
RRRR *The ſeveral Teeth.*
SS *The* dura mater *cut inſunder and turned back.*
T *The* Glandula pituitaria.

Figure

TAB. XXII.

pag. 110.

II



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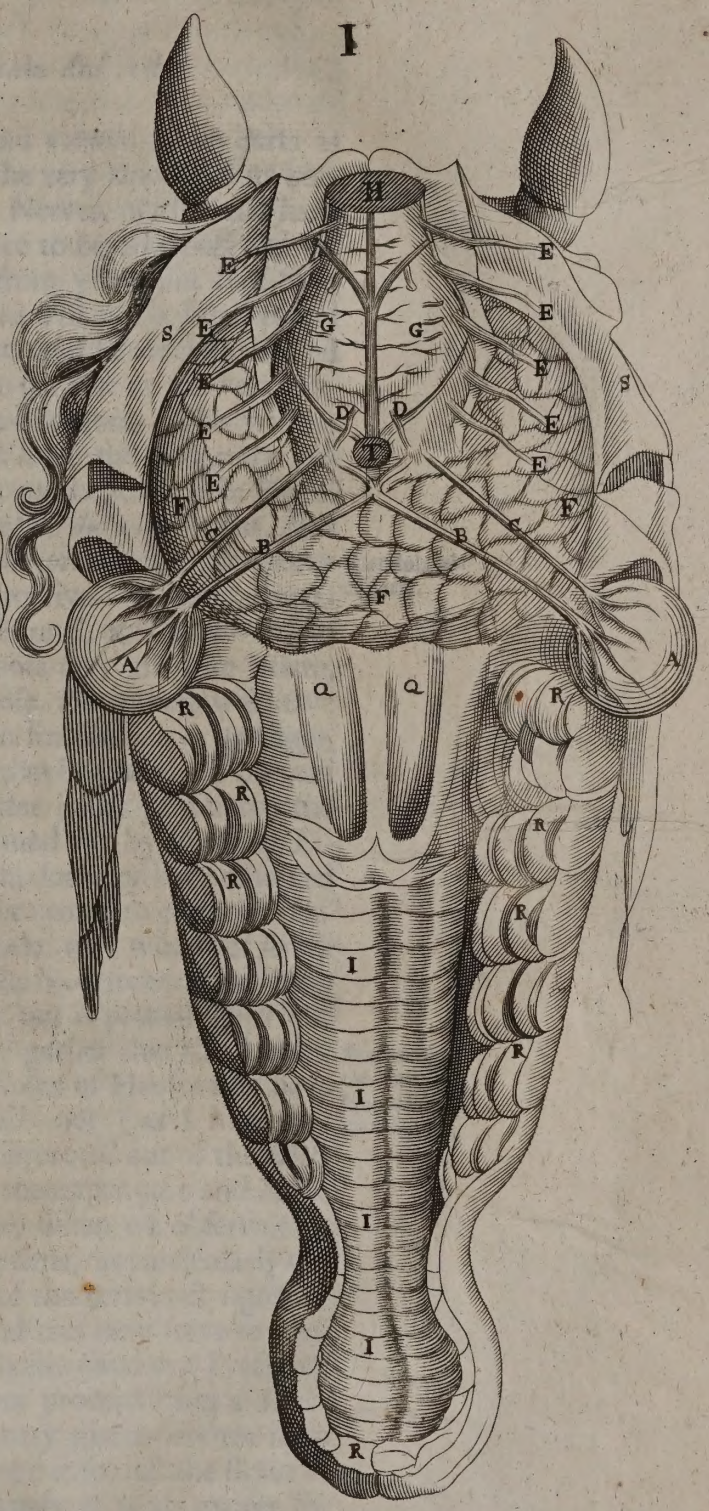


Figure II.

Shews the Skull with the Brain taken out of it.

A *Shews the hole where the Spinal Marrow paſſeth out of the Skull.*
B *The* Glandula pituitaria *or Flegm-gland.*
CC *The Optick Nerves.*
DD *The bottom of the Skull upon which the Brain did reſt.*

After you have thus taken out the Brain and viewed all its Parts as they appear before you diſſect it, you will at the very middle of its bottom, a little above the uniting of the Optick Nerves, within the hard Skin or *dura mater*, (for that is in the next place to be taken off and removed, otherwiſe it will hide all other Parts from you; but that Skin being removed in the place aforeſaid, I ſay) you will find a ſmall round Kernel, in compaſs about the bigneſs of a Groat, and ſomething flat and round. Its ſeat is in a little hole made for that purpoſe at the very bottom of the Skull, in a Bone called the wedge-like Bone. This will be more plainly ſeen if you take the Brain out and leave the *dura mater* behind; for then you ſee it in its natural poſition, as the letter B in Fig. 2. of the foregoing Table ſhews it: but if you take the *dura mater* out, this comes out with it. This Kernel is called *Glandula pituitaria*, the ſnotty or flegmey Kernel, from its office, which is to receive the ſnotty Excrements of the Brain from the *Infundibulum* or Funnel, and afterward to tranſmit or convey them away, as ſome Authors ſay, into the Palate, from thence to be avoided by the Mouth or Noſe. But others will have it, that it is ſent into the Jugular Veins by two ſmall ducts or paſſages, one on each ſide, being branches of one Trunk that begins at the bottom of the ſaid Gland, and is divided into two, after it has penetrated the wedge-like Bone. Which paſſages they have found out by injecting Liquors of ſeveral colours with a ſyringe into them, for they have obſerved the ſaid Liquors to paſs into the Veins, but none to come to either the Palate or Noſe. By which Experiment they conclude, that whatever *ſerum* or wheyiſh or flegmatick Humour iſſues out of the Ventricles of the Brain through the Funnel, diſtils not upon the Palate, but is poured again into the Bloud and mixed with it. Whence we may gather that the Rheum or Snot which iſſueth ſo plentifully out of the Noſes of Horſes that have great Colds, and alſo of glander'd Horſes, falls not (as I have my ſelf ſometimes thought) from the Brain, but is ſeparated out of the Arteries from the Bloud by the Glands or Kernels of the upper part and inſide of the Noſe. Which we may the rather believe, when we obſerve that other Glands are ſwell'd with Rheum at the ſame time, as particularly the Kernels under the Horſe's Jaws; which is one of the certaineſt ſigns we have of a Horſe's inclining to the Glanders. And this may ſerve to convict of errour all our ancient Authors who did hold, (and our Practitioners who at this day do hold) that the Glanders proceed from a defect and waſting in the Brain; and that all that ſnotty matter comes from thence which iſſues out of the Noſe. Which were it ſo, all the Brain in the Horſe's Head would not be ſufficient to ſupply it with matter for three daies, according to the quantity that I have ſeen come from one in that time. It is therefore a very falſe opinion, taken up merely upon

Glandula pituitaria.

From whence the Snot is ſeparated in the Glanders.

gueſs,

gueſs, without inſpecting into the Parts, that our Practitioners do commonly entertain concerning this Diſeaſe.

No ſuch Diſeaſe as the mourning of the Chine.

Neither is there ſuch a Diſeaſe as the mourning of the Chine, as they do to this day hold; for it is impoſſible any Creature ſhould continue ſo long alive as till all his Brain be ſo far waſted by this Diſeaſe, that it comes to reach the Spinal Marrow without the Skull, which is that I ſuppoſe they call the Chine.

But this Diſeaſe, by them called the mourning of the Chine, is diſtinguiſhed into a different Diſeaſe from the former from the Matter's altering its colour; for it is generally obſerved that after the Horſe hath had this Diſeaſe running on him for ſome time, the corrupt Matter or Snot changes by degrees from an indifferent white to a more dull colour, inclining at firſt to a little reddiſh, but after a longer time, eſpecially when the Horſe begins to grow towards his end, it will be very black and very nauſeous both to ſee and ſmell.

From this alteration of the colour, as I have ſaid, I do believe they give the Diſeaſe this proper and diſtinguiſhing name of mourning of the Chine; whereas it is onely a greater degree of one and the ſame Diſeaſe, in which the Chine is not at all affected, at leaſt no more than any other Part of the Body, all of which languiſhes away by this inveterate Diſtemper. By what ſteps it proceeds, and how the Matter comes to alter its colour, I will give you my opinion.

The maſs of Bloud being depraved either by unwholſome Food, or by great Colds, or laſtly by infection from the Air and from other Horſes (for this Diſtemper is catching) this flegmatick Matter collected in it is ſpued out of the ends of the Arteries in the upper part of the Noſtrils, about the ſpongie Bones chiefly; for in an Horſe there is little of this Matter comes out of the Mouth, but it ſtill deſcends by the Noſtrils. This Humour, I ſay, diſtilling out of the Arteries by the ſpongie Bones continually, doth in proceſs of time ſo fill the ſaid Bones with filthy Matter, that like a Sink or Chanel being choaked up with filth, there is not ſo free a paſſage for the Humour, as when the Diſeaſe firſt began; ſo that the Matter by that means is there ſtayed, and by its continuance there it acquires ſo bad a quality that it corrodes and cankers thoſe Bones, and indeed ulcerates and gangrenes all the paſſages of the Noſtrils, till it have mortified and conſum'd them (as happens ſometimes to Venereal Perſons) and at length deſtroy'd the Beaſt: for indeed it is ſeldom or never curable when it is once come truly to be a Canker.

Now by the foulneſs of theſe Bones (as I have ſaid) that Matter or Snot which doth deſcend by theſe paſſages, (which indeed doth at length drivel down in a greater quantity than before, by reaſon of the paſſages being widened from the Parts being gnawn aſunder by the cankered Humour; I ſay that Matter or Snot which doth deſcend after this) is of a contrary colour to what it uſed to be, for it is become more black and wateriſh, mixed with a little Red, and hath a very ill ſmell: but this alteration happens not from the Matter's flowing from a new Part, but is cauſed by reaſon of the foulneſs of the Parts through which it paſſeth, for from thence it hath its dye in a great degree.

Not but that there is yet another cauſe of it, which is the greater foulneſs of the Bloud: for as the beginning of the Diſtemper did proceed from the corruption or depravation of the Bloud, which was become as it were degenerate from its ſpirituous, balſamick and volatiliſed condition, into a

flat

ſlat and vappid ſtate, like to dead Wine; ſo in proceſs of time for want of the Spirits to quicken it, and cauſe the fermentations neceſſary in the proper places of the Body, where the excrementitious parts of the bloud ſhould be thrown off, (there being ſeveral Bowels of the Body appointed to ſeparate, and ſome that have Receptacles to receive the ſame) I ſay, for want of theſe Spirits to cauſe a fermentation whereby the excrementitious parts of the Bloud ſhould be thrown off, ſuch Excrements are collected every day in greater quantity, and acquire a greater degree of malignity, being hardly any part of them diſcharged any other way but this, which is preternatural, and moſt times becomes deſtructive to the Beaſt, after the Diſeaſe hath arrived to this height.

Thus have I given you my opinion concerning this Diſtemper, which though it be new, will I hope to the intelligent Reader appear to be truer than that of our Ancient or Modern Practitioners, few of whom (I may affirm without boaſting) have made ſo diligent an inquiry into this Diſtemper as I with great pains and charge have done; for if they had, they would with great eaſe ſee themſelves in an error, and no more believe that there is or can be ſuch a Diſeaſe as the mourning of the Chine. But enough of this, (though I hope it will not be deemed to be from the purpoſe:) I ſhall therefore return from whence I have digreſſed, and deſcribe the remaining Parts of the Brain.

Having examined ſufficiently the *Rete mirabile* or wonderfull Net, as alſo the Pituitary Gland, if you then remove the *dura mater* quite from the Brain at the baſis or bottom of it, there will appear the head of the Spinal Marrow, ſo much as is contained within the Skull, of which we have treated in a foregoing Chapter. There may be alſo plainly ſeen the riſe of the ſeveral conjugations or pairs of Nerves, of which we will treat at large in a convenient place; alſo the bottom of the Cerebel or After-brain, as the next Table doth demonſtrate to you.

The Infundibulum *or Funnel.*

After theſe you may take a plain view of the end of the *Infundibulum* or Funnel, (a cavity ſo called) which end reaches (before diſſection) to the Pituitary Gland, upon which it pours the flegmatick Excrements of the Brain, as hath been already ſhewed.

This Funnel is ſo called from its ſhape; for above, the head thereof is large; but the lower part, is a long and ſtrait Pipe. By ſome Authors it is called *Pelvis* the Baſin. Its beginning is ſaid to be on the fore-part of the *third* Ventricle, by ſome ſo called, but I could never in a Horſe ſee more than two that I could properly call Ventricles, between which two this Funnel is ſeated, and into which they do empty themſelves, diſcharging their ſerous or wateriſh moiſture into it. This Funnel I have often found near filled with a thickiſh Flegm; and Doctor *Willis* ſays that in an Horſe's Brain he has obſerved it wider than a Gooſe-quill, and full of a clear Water.

Corpora ſtriata, Nates, *and* Teſtes.

Next come we to ſpeak to thoſe Parts of the Brain that lie hid, and cannot well be ſeen without diſſecting of it; and firſt of the *Buttocks* and *Stones*. Theſe are four orbicular Prominences or round Bodies jetting out of the *medulla oblongata* (or head of the Spinal Marrow) of which the two firſt, namely the Buttocks, are largeſt, and the latter (*viz.* the Stones) ſeem to be onely accreſcences to them. The Buttocks ſtand lowermoſt, and adhere to the Brainlet; (as do alſo the Stones.) They are larger than in a Man, and look of a fleſhy colour while they are cloathed with the *pia mater*; but that being removed, they appear yellowiſh,

yellowiſh, and of a different colour from the reſt of the Marrow. But of theſe we diſcourſed before at the beginning of the fourth Chapter; as alſo of the *corpora ſtriata* or utmoſt ends of the *medulla oblongata*, that adhere to the Brain properly ſo called.

Theſe four Prominences are by Doctor *Willis* compared to Mole-hills, and are therefore by him ſo called. They may be plainly ſeen if you but lift up the hinder part of the Brain after you have ſeparated it from the After-brain, turning it as far back as you can without breaking it.

The Pine-apple Gland. Between theſe four Prominences, or rather between the two lower of them, to wit the Buttocks, there is placed a certain Glandule or Kernel, which goes by the name of *glandula pinealis*, or Pine-kernel Glandule, from the reſemblance it is ſaid to have with the Kernel of a Pine-apple. It is alſo called the Yard or Prick of the Brain, from its being placed ſo near the Buttocks and Stones, as alſo becauſe it reſembleth a Man's Yard. This Gland as alſo the Buttocks and Teſticles before-ſpoken of are repreſented in the next Table.

Its uſe. Concerning the *uſe* of this Glandule there are great diſputes among the Learned; but I ſubſcribe to *Bartholin*'s opinion, who believeth its uſe to be the ſame with that of other Kernels, which is to ſeparate the *Lympha* from the Arterial Bloud.

There is as it were a chink between the Buttocks near this Glandule, which I think fit to mention, becauſe moſt Authours ſpeak of it. Some give it the name of *Anus* or Arſe, others call it *Vulva*; but why they have impoſed ſuch names as theſe upon theſe Parts, I cannot judge, nor is it worth the while to inquire, ſeeing they have no other foundation but fancy: however, ſince they are known by theſe names, I did think it fit not to paſs them by, finding them as plainly to be ſeen and as eaſie to be found in Horſes as Anatomiſts find them in Humane Brains.

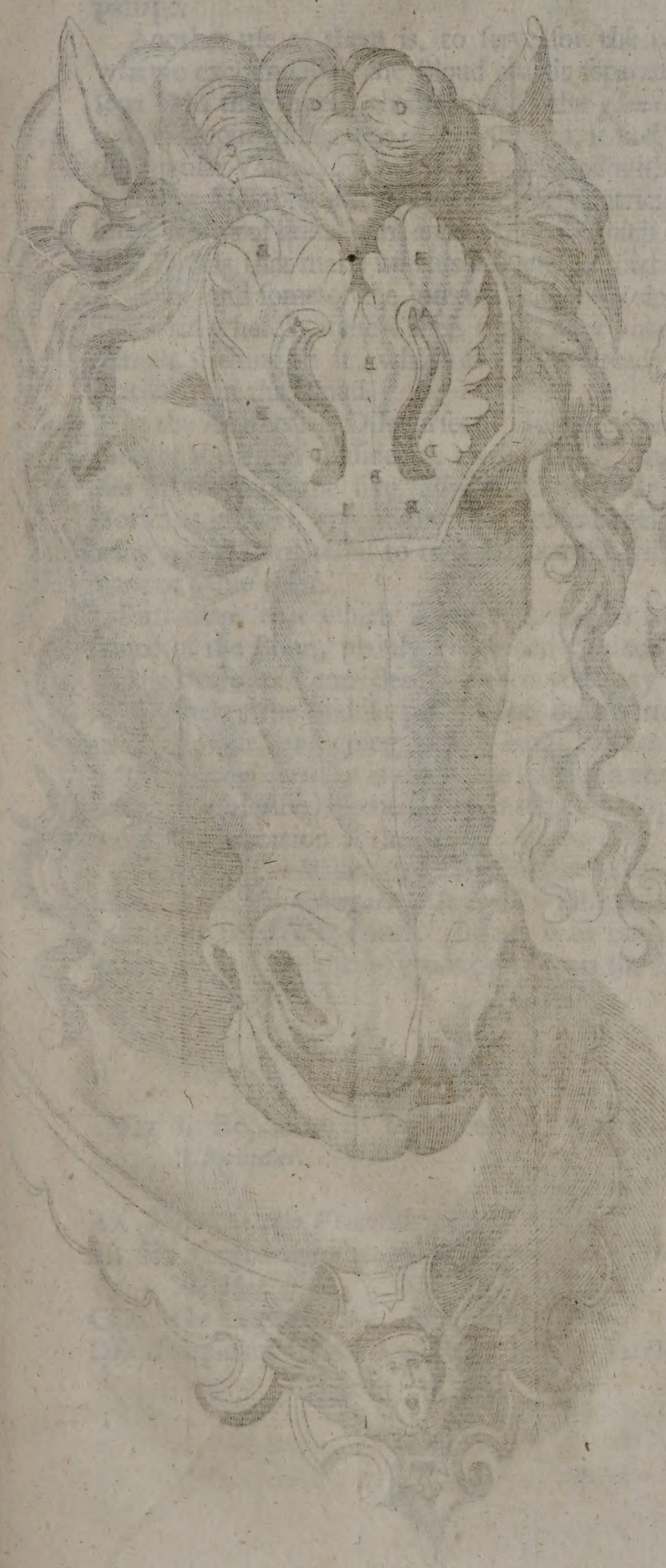
The Ventricles. I come in the next place to ſpeak to the *Ventricles* of the Brain, which are by ſome accounted four, by others three; but if diſſection be made by beginning from beneath, there will appear onely two: and indeed I could never find more; for that which is called the third, I cannot think to be one, but rather a portion of the other two joined together. Nay, ſome Authours will have it that there is but one, being onely divided at the beginning, but at the end they unite into and become one common Cavity, as any one that will diligently trace them may obſerve.

The manner of diſcovering them. To ſee theſe Ventricles you muſt cut the whole ſubſtance of the Brain inſunder in or as near the middle as you can gueſs, dividing the upper from the lower ſide, whereby you will diſcover them in the middle of the Brain of that ſhape as the firſt Figure of the following Table repreſents them in: for there they are repreſented to the life, as much of them I mean, as can be ſeen without farther diſſection; and appear to be of a ſemicircular or Half-moon ſhape. But if you cut the Brain further, and ſo follow their Cavities lightly with a Probe *forwards* down towards the Noſe (for there they ſink deep into the callous body, or white inner part of the Brain) you will trace them as far as the mammillary Proceſſes; and if *backwards*, you will find them to deſcend as far as the baſis or bottom of the Brain; and then if you will take a view of them when you have laid them ſo far bare both ways, you will find them to reſemble in ſhape an Horſe-ſhoe.

Their uſes. Now the *uſes* of theſe Ventricles according to the divers opinions of Authours are many, but I will follow the moſt Modern in this point.

Firſt

I



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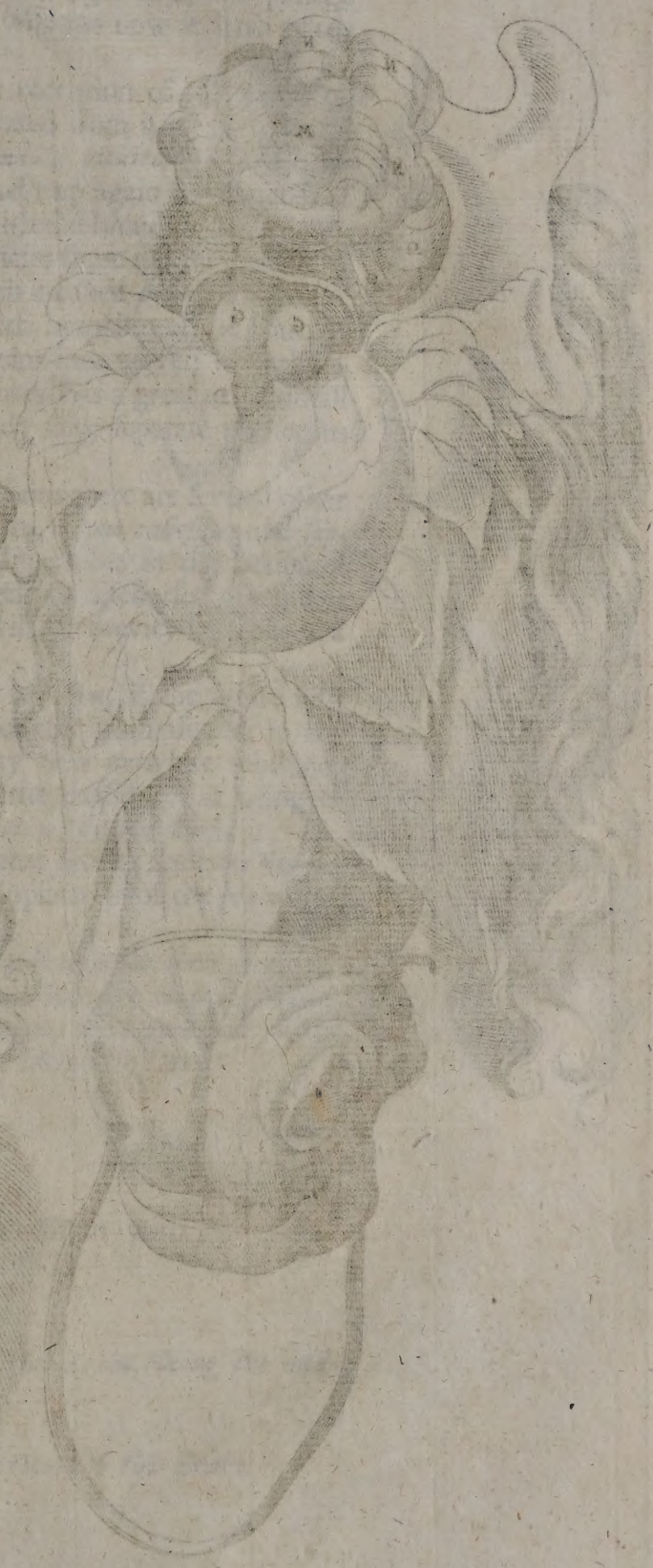


II

I

Firſt then they are framed for the more eaſie paſſage of the Bloud; for along their ſides do paſs many branches of the Bloud-carrying Veſſels, which could not ſo conveniently be conveyed through the ſubſtance of the Brain, leſt being compreſſed by the great weight of it, the paſſage of the Bloud ſhould have been obſtructed, whereas now it hath a free paſſage.

Another uſe of them is, to ſerve for the reception of the ſerous or wheyie excrement of the Bloud that is ſeparated from it by the glandulous Skin that inveſts them, and by the *glandula pituitaria*; which ſerous Humour iſſuing out of the Arteries, is ſuckt up again by branches of the Jugular Veins, and is by them returned with the Bloud to the Heart.

In the Membrane that cloaths theſe Ventricles there is a contexture of ſmall Veſſels of both Veins and Arteries, which is called *plexus Choroides*. The Veſſels that make up this *plexus*, are little branches of the Carotid Arteries, and ſome of the internal Jugular Veins interwoven with them. The Skin wherein theſe Veſſels are ſo interwoven has a great many ſmall Kernels ſticking in it, which as I have already ſaid, ſeparate the ſerous Matter from the Bloud.

In the Anatomical Diſcourſes of Humane Brains there are ſeveral other Parts of the Brain conſidered, as the *fornix*, the *corpus calloſum*, the *ſeptum lucidum* and the like, all which are as diſcernible in the Brains of Horſes as in Men, and might therefore as largely be diſcourſed of: but it being not very material to treat of them, I will for brevity ſake but in a manner name them.

Firſt then, that which is called the *corpus calloſum*, is the white ſubſtance of the Brain, plainly ſeen when you cut the Brain aſunder in the middle to ſee its Ventricles; for then you may view its white ſubſtance which makes the middle part of the Brain; the outſide of it being of an Aſh-colour, and going by the name of *cortex*, or *the bark*.

The *ſeptum lucidum* is onely the Partition that divides the two Ventricles above-deſcribed, ſome taking it to be a reduplication of the *pia mater*, and others a portion of the Brain.

The *Fornix* or Vault is a kind of an Arch that ſtands between the Brain and the *medulla oblongata*. It is of a ſubſtance like the *corpus calloſum*, and is of a triangular figure. Its uſe is to bear up the upper part of the Brain, that its weight may not preſs upon the ſubjacent Parts.

Table XXIII.

Fig. I. Repreſenteth the Ventricles of the Brain with the *plexus Choroides*.

AA *Shew the two Ventricles of the Brain.*
BB *The* corpus calloſum *or white ſubſtance of the Brain, being the middle part of it.*
CCC *The* Cerebellum *or After-brain.*
DD *The* plexus Choroides *ſeated in the Ventricles of the Brain.*

Fig. II. Repreſents the protuberances of the *medulla oblongata* called *Nates* and *Teſtes*, and alſo the *Glandula Pinealis.*

D *The* Glandula Pinealis *or Pine-kernel Glandule.*
GG *Thoſe two bunchings out of the* medulla oblongata *called* Teſtes *or Stones.*
HH *Its other two protuberances called* Nates *or Buttocks.*
II *A Ventricle between the Brainlet and roots of the* medulla oblongata, *by ſome Authours called the fourth.*
MM *The* Proceſſus Vermiformes *or Worm-like Proceſſes.*
NNN *The other Parts of the After-brain.*
OOO *Part of the* Cerebrum *or Brain to be ſeen under the After-brain.*

CHAP. VI.

Of the Action of the Brain, and the exerciſes of the Animal Faculty by the Nerves and Fibres.

HAVING hitherto ſpoken of the ſtructure of the Brain, and diſcourſed of all its Parts; I come in the next place to ſpeak of its *Action*, in general, and to ſhew, according to the opinion of our moſt Learned and Modern Authours, how the Animal Faculty exerts it ſelf.

The action of the Brain. It is generally agreed that the proper *action* of the Brain (taken in a large ſenſe) is the elaborating of Animal Spirits; which Spirits are conveyed from it by the Nerves into the ſeveral Parts of the Body for the performing of the Animal actions or motions; for all voluntary motions are performed by the help of theſe Spirits.

What the Animal Spirits are made of. Theſe Spirits are made out of the Vital Spirits and Arterial Bloud, as out of their proper matter. And the place wherein, or the principal inſtrument that elaborates them, is not the Veſſels, but the very ſubſtance of the Brain, into whoſe parenchyma or marrowy ſubſtance the Bloud and Vital Spirits are extravaſated.

Now concerning the manner how this Work is performed there are great controverſies amongſt the Learned, and many arguments urged by each, which will be too tedious here to recite: I will therefore give you onely the opinion of a late Worthy Authour as delivered in his own words.

How the Animal Spirits enter into the Nerves; "The Heart, ſays he, is like the *primum mobile* of the Body, to "which the motion of all the Humours that have once paſt it, is owing. "This by its *ſyſtole* impells the Bloud as into all other Parts, ſo into the "Brain, by the ſeveral branches of the *Carotides*, whoſe innumerable "twigs run partly through the outer *cortex* or greyiſh part of the Brain, "and partly into the inner medullar or white ſubſtance of it. Theſe "twigs of Arteries ſpring partly from the *Plexus Choroides* and *Rete mi-*"*rabile*, and partly from the *Carotides* themſelves immediately. The "ſuperfluous *ſerum* of the Bloud is ſeparated by the Glands before de-

"ſcribed;

" ſcribed; and that Bloud which is not elaborated into Animal Spirits, is " returned again to the Heart by the Veins. But thoſe particles that are " fit and proper to be converted into them, are extravaſated into the ve- " ry parenchyma of the Brain, or at leaſt are diſtributed through it by " inviſible capillaries, in which being perfected into Spirits, theſe by the " help of the Fibres or Filaments which the inner part or ſubſtance of the " Brain chiefly conſiſts of, are conveyed into the *Corpora ſtriata* (or " other Proceſſes of the *medulla oblongata* that adhere to the Brain) which " conſiſt of the like Filaments, and by them to the Nerves, whoſe inner " ſubſtance is fibrous like the *medulla* from whence they ſpring. And " the reaſon of this ſucceſſive motion from one to another, is the pulſe of " the Heart, whereby that which comes behind always drives forward " what is before. Whence (ſays my Authour) the true cauſe of an Apo- " plexy (wherein motion and ſenſe are almoſt quite aboliſhed) is from " the obſtruction or compreſſion of the Arteries of the Brain: whereby " both little Bloud and Vital Spirits can be conveyed thither to make " Animal Spirit of; and alſo when it is made, it is not impelled out of " the Brain along the Fibres into the Nerves, to enable them to perform " their functions. Theſe are the words of that worthy Authour concer- ning this Work.

It remains now to inquire how theſe Spirits, after they are thus elabora- ted, do perpetually flow from the Brain through the paſſages of the Nerves, and how they enter and fill the ſeveral ſorts of Fibres of which the mo- ving and ſenſitive Parts conſiſt.

And how into the Fibres.

That the Brain and Cerebel are the firſt fountain of the Animal Spi- rits I have in my foregoing Diſcourſe already ſhewed; from whence they flow along the Nerves as by ſo many rivulets unto differing and di- ſtant Parts; till at length they paſs out of the moſt capillary Nerves into the ſmall Fibres interwoven in the Membranes, the muſculous Fleſh, and other Parts, and laſt of all into the tendons of the Muſcles, making them the organs of Senſe and Motion: in which Parts becoming more fixed, they are called the *implanted* Spirits, attending their office whenſoever the Nerves with their *influent* Spirits bring from the Brain the inſtinct for performing the ſame.

Whence the Fibres ariſe.

Now concerning theſe *nervous Fibres* in their ſeveral Parts, which are the immediate inſtruments of the Animal Faculty, we ought to inquire from whence they have their riſe: It is plain they do not ariſe immedi- ately from the Head, or any of its marrowy Parts; neither can we reaſo- nably judge them to ſpring from the Nerves, becauſe the Fibres in moſt Parts do much exceed the bulk or bigneſs of the Nerve that is brought to them, as may be eaſily ſeen by the tendon of every Muſcle, which being made up of united Fibres, is obſerved to be far greater than the Nerve that is inſerted into the Muſcle: ſo that it is unlikely they ſhould be onely continued portions of the Nerves divided or jagged into fine threds, as ſome have imagined; and it is more probable that they are ſpermatick and primigenial Parts, that is, that the rudiments of them were drawn in the firſt formation of the Parts of the Embryo in the Womb, as well and as ſoon as the Nerves themſelves; unleſs one would with Doctor *Willis* except the Fibres of the ſanguineous Parts, which he thinks to be bred ſecondarily of the Bloud and nervous Juice flowing into thoſe Parts.

They can move by the Spirit implanted in them.

One thing further we muſt note concerning theſe Fibres, that they are enabled to perform their motion, not onely from the Animal Spirits that flow by the Nerves at the inſtant of ſuch motion, but alſo from the Spirits that are ſtored up in the Fibres themſelves; of which any one may ſatisfy himſelf in obſerving an Animal newly killed when its Skin is taken off; for when life is periſhed, and all the force of the Spirits flowing in through the Nerves hath quite ceaſed, yet the Spirits implanted in theſe Fibres breaking forth from the Muſcles ſtill move and ſhake them, and force them into ſeveral convulſions and trembling motions. This I have not onely ſeen my ſelf in ſeveral Horſes I have cauſed to be killed on purpoſe to diſſect, but have alſo ſhewed it to ſeveral Spectators who have been very much pleaſed at the obſervation, and at the variety of their motions.

CHAP. VII.

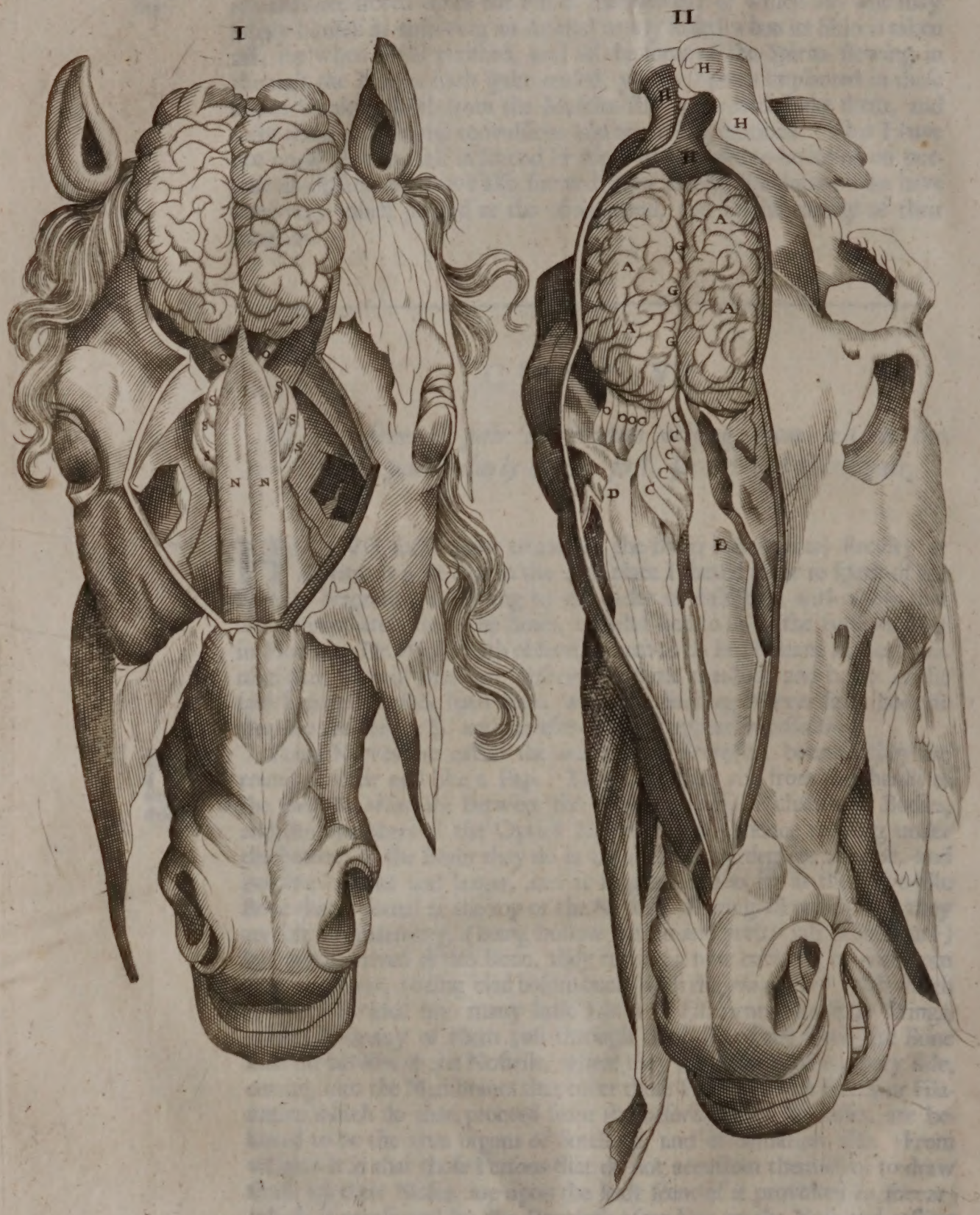
Of the ſeveral pair of Nerves ariſing from within the Skull, particularly of the firſt, ſecond and third pair.

HAVING ſufficiently treated of the Brain and Animal Faculty or Spirits, it is fit that in the next place I ſhould come to ſpeak of the Nerves, beginning according to the order of diſſection with thoſe that ariſe immediately from the Brain, which I find to be of the ſame number in Horſes as Dr. *Willis* hath obſerved them to be in Humane Bodies, *viz.* nine pair. I will therefore obſerve the ſame method, and begin as the ſaid Learned Doctor hath done, with the *ſmelling Nerves* firſt, becauſe they are the foremoſt, and therefore do firſt appear in diſſection.

The firſt pair of Nerves, viz. the Smelling.

Theſe Nerves are called the *mammillary Proceſſes*, becauſe they are round at their end like a Pap. They take their riſe from the ſhanks of the *medulla oblongata* betwixt the *corpora ſtriata* or chamfered Bodies, and the chambers of the Optick Nerves; from whence running under the bottom of the Brain they do in their courſe by degrees increaſe, and become broader and larger, and at length reach as far as the Sieve-like Bone that is ſeated at the top of the Noſtrils. During all which way they are ſoft and marrowy, (being hollow within and pretty full of moiſture) but being arrived at this Bone, they receive a new covering or coat from the *dura mater*, (being clad before onely with the *pia mater*) with which they are divided into many little Fibres or Filaments like little ſtrings, which do many of them paſs through the holes of the Sieve-like Bone into the cavities of the Noſtrils, where they are diſtributed on every ſide, entring into the Membranes that cover thoſe Parts. Theſe Fibres or Filaments which do thus proceed from the before-named Proceſſes, are believed to be the true organs of Smelling, and of Senſation alſo. From whence it is that thoſe Perſons that do not accuſtom themſelves to draw ſnuſh up their Noſes, are upon the leaſt ſcent of it provoked to ſneeze: which is occaſioned by the Powder's aſcending up the Noſe and reſting upon the tender Membranes thereof, wherein the little Fibres of the ſmelling

TAB. XXIV.



ling Nerves being diſperſed, are immediatly irritated or provoked into a convulſive motion, which is that we call ſneezing. It was an old opinion that the Snivel was milked as it were out of the Ventricles of the Brain by theſe Proceſſes; but having above in the fifth Chapter ſhewn other Veſſels which diſcharge that flegmatick matter into the Noſe, namely the Arteries, it ſeems more probable that theſe Mammillary Proceſſes have a nobler uſe, namely *that* we have aſcribed unto them, to be the inſtruments of ſmelling. And therefore they are larger in Horſes and all ſorts of Cattle than in Men, becauſe it was neceſſary their Smell ſhould be very exquiſite, ſeeing they can diſtinguiſh of the wholſomneſs or hurtfulneſs of their Food by that Senſe onely.

Table XXIV.

Fig. I. Shews the Mammillary Proceſſes, and the Bones at the upper part of the Noſtrils.

NN *Shew the Cartilaginous or griſtly Bones of the Noſtrils.*
OO *The Mammillary Proceſſes or Smelling Nerves.*
SSSS *The Sieve-like Bone through whoſe holes the Fibres of the Smelling Nerves are branched.*

Fig. II. Shews the Brain in its natural ſituation, and the Parts aforeſaid, *&c.*

AAAA *Shew the Brain in its natural ſituation covered with the* pia mater.
CCCC *The ſpongy Bones laid bare.*
D E *The griſtly Bones of the Noſtrils.*
GGG *The Partition which divides the upper part of the Brain into two parts, a right and a left.*
HHH *The* os occipitis *or Noll-bone.*
OOOO *The Sieve-like Bone, upon which the Mammillary Proceſſes do reſt.*

The ſecond pair, or Optick Nerves.

Next come we to the ſecond conjugation or pair of Nerves, and thoſe are the *Optick* or Seeing *Nerves*; ſo called, either becauſe they carry the viſive Spirits to the Eyes, or becauſe they convey the repreſentations of viſible things from the Eyes to the Brain.

Theſe ariſe a little behind the former out of the *medulla oblongata*, and having proceeded a while with a certain compaſs, they are united above the ſaddle of *os ſphenoides*, and that with a total confuſion and mingling of their ſubſtances, as far as by the naked Eye I could ever diſcern in all Horſes that I have diſſected; though ſome Authours ſay that in Humane Bodies they do unite indeed, but that it is onely by contact, without confounding their Fibres with one another.

Theſe Nerves after they are thus united, do ſoon after again ſeparate, and go out of the Skull into the centre of the Eyes, three of whoſe coats are made out of the ſubſtance of theſe Nerves being dilated.

At their riſe and a pretty way in their progreſs they are very ſoft, being covered onely with the *pia mater*; but as ſoon as they reach the *dura mater*, they are covered with *it* alſo, and thereby become ſtronger and harder. This outmoſt Membrane it is which doth conſtitute that coat of the Eye called the horney Coat or *ſclerotica*; and from the inner or *pia mater* doth proceed the next Coat or Skin of the Eye called *uvea* or Grape-like, from its colour; and laſtly the marrowy ſubſtance of the Nerve doth make the third Coat called *Retina* or Net-like.

The Senſe of *Seeing* like that of *Smelling* is by Doctor *Willis* ſaid to be performed not ſo much by the help of the Nerve, as of the Fibres which are interwoven with the Organ; namely, ſaith he, the little Fibres in the Coats of the Eyes, and eſpecially thoſe that are inſerted into the *cornea* or ſclerotick Coat, and diſpoſed after the manner of a Net, do receive the impreſſion of the viſible ſpecies, and by repreſenting the image of the thing ſo as it is offered without, cauſe ſight: but it is the office of the Nerve it ſelf to tranſmit inwardly, as it were by the paſſage of an Optick Tube, that image or ſenſible ſpecies, and to carry it to the common ſenſory.

The third pair, or Eye-movers.

The next pair are the *Eye-movers*, which are by Ancient Authours accounted the *ſecond* pair, but do by our Modern Authours go for the *third* pair.

Theſe take their beginning from the baſis or bottom of the *medulla oblongata* behind the *Funnel*, from whence they proceed forwards by the ſides of the Optick Nerves. At their riſe they are united, whence is a reaſon drawn that when one Eye is moved toward any object, the other is directed alſo towards the ſame.

They are ſmaller, yet much harder than the former, and as was ſaid, run along by their ſides untill they come to the *os cuneiforme* or Wedge-like Bone; where, as the Optick Nerves paſſed through the firſt, ſo theſe paſs through the ſecond hole of that Bone, and ſo on untill they come to the Muſcles of the Eyes, into ſeveral if not all of which they ſend a twig or ſmall branch, which is in each Muſcle ſubdivided into innumerable other ſmaller ones, by which the Animal Spirits are conveyed into the Fibres of the Muſcles, and by conſequence the ſeveral motions of the Eye come to be performed, as ſhall be ſhewed at large in a more convenient place, when I come to treat of the Muſcles of the Eyes in the next Book.

CHAP.

CHAP. VIII.

Of the fourth and fifth pair of Nerves that ariſe within the Skull.

THE *fourth* pair of Nerves do ariſe contrary to all other: for whereas the reſt do take their riſe from the bottom or ſides of the oblong Marrow, theſe have their beginning at the top of it, behind thoſe round bunchings out of the Brain called *Nates* and *Teſtes*, (of which we have already treated where we deſcribed the Parts of the Brain.) From whence bending a little forwards by the ſides of the ſaid oblong Marrow, they are immediately hid by the *dura mater*, under which they run for ſome time, untill they come to that hole of the Skull, where the other Nerves deſigned for the Eyes do paſs out, which theſe accompany, but do not unite with, and at length terminate in the Trochlear Muſcles of the Eyes. *The fourth pair called Pathetick.*

This pair of Nerves are by Doctor *Willis* called the *Pathetick Nerves*, becauſe, ſays he, their office is to move the Eyes *pathetically*, according to the force of the *paſſions* and *inſtincts of Nature*, delivered and remanded from the Brain to the After-brain, and on the contrary from this to that, through the *Nates* and *Teſtes* and their Medullar Proceſſes. For, ſaith that Learned Anatomiſt, ſeeing that by the diverſe impulſe and undulation of the Animal Spirit's dwelling in this by-path, there happen certain mutual commerces between the Brain and *Præcordia* (the Cerebel mediating between either, from whoſe Ring-like Proceſs he will have the Nerves of the *Præcordia* to ariſe;) it is neceſſary that theſe Nerves that are rooted in the middle way, ſhould be ſtruck upon by every march or remove of the Spirits going this way or that way, whereby the motions of the Eyes muſt needs follow the affections of thoſe Parts. With theſe Nerves, (ſaith he) all perfect Animals are furniſhed, there being none but are obnoxious to anger, love, hatred, and other Affections, as may be diſcovered in every little Creature, but much more in this which we are a-diſcourſing of, there being none the aſpect and geſture of whoſe Eyes do ſhew them more than a Horſe's do.

Next come we to treat of the fifth pair, concerning the riſe of which there are ſeveral diſputes amongſt Authours, (Doctor *Willis*, particularly, affirming that they ſpring from the Ring-like Proceſs of the Cerebel:) but if their original be ſtrictly inquired into, I cannot find, in an Horſe, (however it may be in Humane Brains) but that they do take their beginning as the others do, I mean from the oblong Marrow, onely a little below the former pair. *The fifth pair.*

Theſe conſiſt of very many Fibres gathered together, ſome of which are ſoft, and ſome hard; ſo that they ſeem not to be ſo much one ſingle pair of Nerves, as a collection of many ſmall Nerves into one bundle, ſome of which are deſigned for one uſe and ſome for another, being for that purpoſe diſtributed into ſeveral Parts remote one from another; in which they ſerve, in ſome for motion, in others for ſenſe: from whence it is, ſaith Doctor *Willis*, that there is that ſympathy and conſent of actions

actions in thoſe ſeveral Parts to which theſe Nerves are diſtributed. As for inſtance, ſeeing ſome twigs go to the Eyes, others to the Palate of the Mouth, Noſe, *&c.* therefore when we ſee or ſmell what pleaſes our Palate, our Mouth waters, as we commonly phraſe it.

But that it may be better underſtood what and how many Parts have conſent by means of theſe Nerves, it will be convenient to diſcover their diviſion, progreſs and different inſertion. Their Trunks, beginning or ariſing out of the oblong Marrow, as hath been ſhewed, are divided each of them into two notable branches, the firſt whereof tending ſtreight *downwards*, and going out of the Skull by their proper holes, are in their deſcent towards the lower Jaw, (for whoſe Parts, ſaith my Authour, they are chiefly deſign'd) divided into many leſſer branches, which provide for the Temporal Muſcles, as alſo for the Muſcles of the Face and Cheeks. From theſe branches alſo there go twigs or little ſhoots into the Lips, Gums, roots of the Teeth, Jaws, Throat, and to the farther end of the Palate, and alſo to the Tongue.

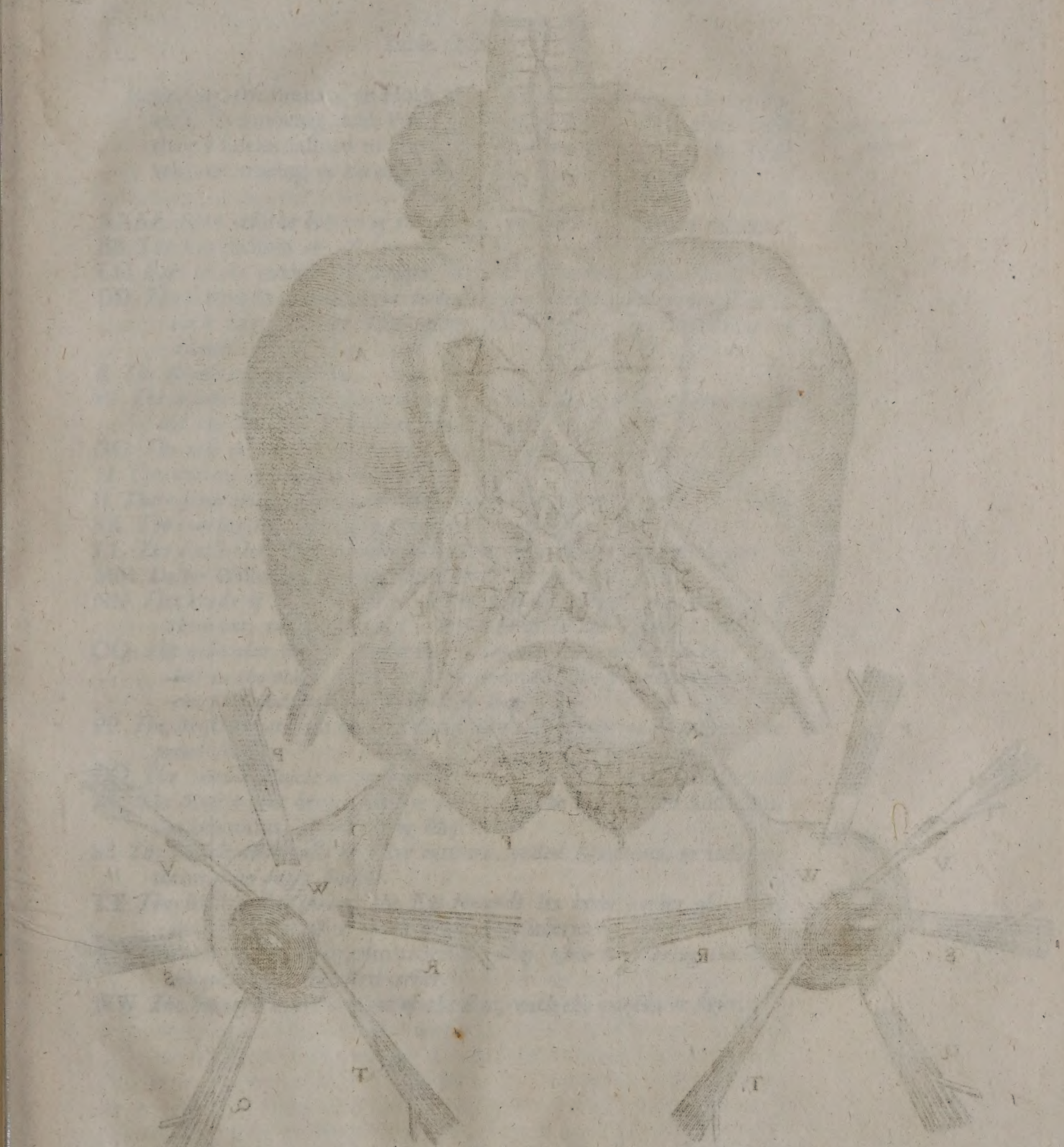
The other branches of this pair of Nerves are called the *ſuperiour* or uppermoſt branches, being larger than the other, and do thus run their courſe. After their diviſion from the former they go ſtreight forward for a little ſpace under the *dura mater* nigh the ſide of the Bone called the Turkey chair, and over againſt the *glandula pituitaria* ſend little twigs to the Trunk of the *Carotides*, that makes the *wonderfull Net:* then they are inoculated into the Nerves of the ſixth pair, and from thence ſend back ſometimes one, ſometimes two ſhoots a-piece, which being united with two other ſlips turned back from the Nerves of the ſixth pair, do conſtitute the root or firſt trunk of the intercoſtal pair of Nerves, reckoned for the ninth pair, of which more ſhall be ſpoken by and by in the tenth Chapter.

After they have ſent out the ſlips for the root of the Intercoſtal Nerve, theſe ſame great branches of the fifth pair are again divided each into two notable branches; the *leſſer* and upper of which tends towards the globe of the Eye, and being again divided ſends forth two other, the *firſt* of which is parted into two more, that go, one, to the Noſe, and the other to the Eye-lids; and the *ſecond* into four or five ſlips, that are moſtly ſpent on the Eye-lids, but partly on the Coats of the Eye and its Glands.

The ſecond or *greater* branch of the ſecond diviſion of theſe Nerves, being carried towards the orbit of the Eye, is again divided into two new branches: the *lower* of theſe being bent downwards, and cleaving it ſelf into many ſhoots, is beſtowed on the Palate and upper region of the Jaws; the other, being the *higher*, is carried beyond the orbit of the Eye, and paſſeth through a proper hole of the upper Jaw with the Vein and Artery which it twiſts about, and ſends many ſlips to the Muſcles of the Cheeks, Lips, Noſe, and roots of the upper Teeth.

The reaſon of bluſhing. From this pair of Nerves being diſtributed to ſo many Parts, I ſay, may the conſent of thoſe Parts one with another be learned: and particularly this is worthy obſervation, That ſeeing they twiſt about the Bloud-veſſels that go to the Cheeks, *&c.* hence it is, that when in Men and Women the Animal Spirits are diſturbed by the imagination of ſome uncomely thing; as if they took care to hide the Face, they enter theſe Nerves diſorderly, whereby their twigs that embrace the Bloud-veſſels do compreſs and pull them, ſo that the Bloud comes to flow too impetuouſly into the Cheeks, *&c.* by the Arteries, and is detained there for ſome time

by



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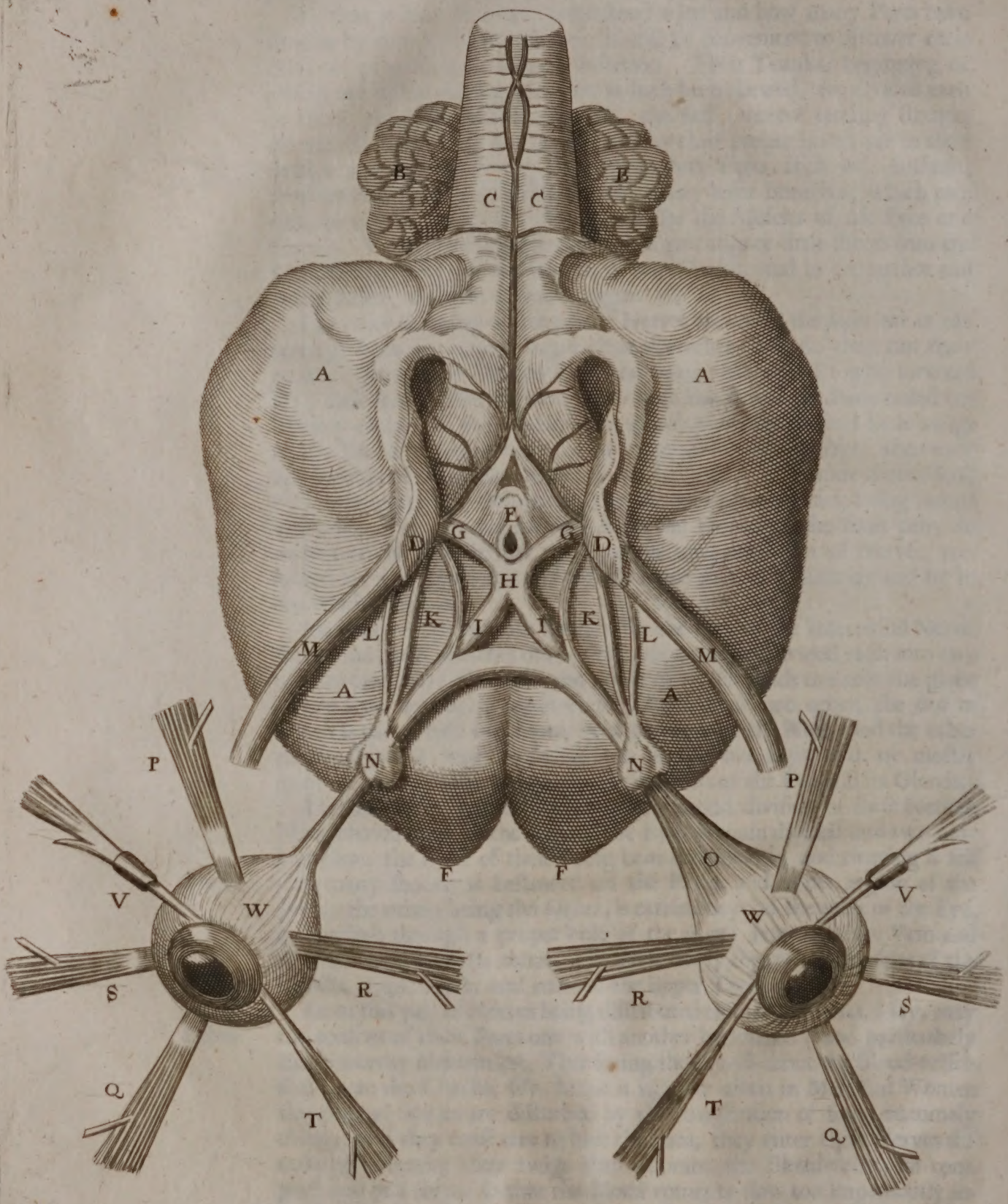

by ſtraitning the Veins. But ſuch obſervations belong more to an Anatomiſt of Humane Bodies to which they are proper, and therefore I ſhall return from this digreſſion, which yet, I hope, will not be unpleaſant to the inquiſitive Reader.

Table XXV.

Repreſents the Brain of an Horſe taken out of the Skull, with the Optick, Eye-moving, and Pathetick Nerves; as alſo the Eyes with their Muſcles faſtned to them, having been taken out of the Skull without tearing or breaking of them.

AAAA *Shew all the bottom of the Brain covered with the* dura mater.
BB *The* Cerebellum *or After-brain.*
CC *Part of the* medulla oblongata, *or head of the Spinal Marrow.*
DD *The* Glandula pituitaria *cut in two in the middle, and turned back to each ſide with the* dura mater, *the better to ſhew the Chink or Funnel.*
E *The Chink called* Vulva.
FF *The Mammillary Proceſſes covered with the* dura mater, *otherwiſe called the Smelling Nerves or the firſt pair.*
GG *The riſe of the Optick Nerves, or ſecond pair.*
H *The uniting of the Optick Nerves.*
II *Their ſeparating again, and their courſe down to the Eyes.*
KK *The moving Nerves of the Eyes or the third pair.*
LL *The Pathetick Nerves reckoned by Doctor* Willis *for the fourth pair.*
MM *Doctor* Willis *his fifth pair of Nerves.*
NN *The heads of the Muſcles of the Eyes, from whence they were all of them cut, to be ſeparated and placed as in the Figure.*
OO *The orbicular Muſcle of the Eye in its natural ſituation in this Eye, but in the other Eye it is quite removed, the plainer to ſhew the courſe of the Optick Nerve to the Eye.*
PP *The Muſcle that pulls up the Eye, called* Attollens, *or* ſuperbus, *the proud Muſcle.*
QQ *The humble Muſcle or puller-down of the Eye, called* humilis.
RR *The Muſcle that brings the Eye inwards to the Noſe, called* Adducens, *or* bibitorius, *the drinking Muſcle.*
SS *The Muſcle that pulls the Eye outward, called* Abducens, *or* indignatorius, *the angry Muſcle.*
TT *The Muſcle that brings the Eye towards its inner corner obliquely, and from that office is called* obliquus inferior.
VV *The* obliquus ſuperior cum trochlea, *whoſe office is to bring the Eye obliquely to its outward corner.*
WW *The horney Tunicle or Coat of the Eye, with the* pupilla *or ſight.*

CHAP. IX.

Of the ſixth and ſeventh pair of Nerves ariſing within the Skull.

The ſixth pair.

THOSE Nerves which are by Doctor *Willis* reckoned for the *ſixth* pair, are in the next place to be ſpoken to. Theſe take their beginning juſt by the fifth, and being for a little time hid under the *dura mater*, go at length out of the ſame hole of the Skull with the before-named fourth and fifth pairs, and are carried each with a ſingle Trunk nigh to the Sockets of the Eyes; but ſo, that near the ſide of the Turky-chair-bone they are inoculated with the ſecond or greater branches of the fifth pair. Whence they ſend back ſometimes one, ſometimes two twigs, which being united with the firſt or recurring branches of the fifth pair, as was noted in the foregoing Chapter, do conſtitute the beginning of the Intercoſtal Nerves. Afterward going a little forwards, each of them near the Orbit or Socket of the Eye, is divided into two branches; one of which is inſerted into the Abducent Muſcle of the Eye (or the Muſcle that draws the Eye outward) which is ſeated in its outer corner; and the other being ſplit into very many Fibres is beſtowed on the ſeventh Muſcle of the Eye, which is ſaid to be proper onely to Brutes. Whether Men do wholly want them, let others examine; however, in the Animal we are treating of, they are very conſpicuous and moſt eaſie to be found, concerning whoſe uſe I will ſpeak when I come to a proper place for that purpoſe.

The ſeventh pair, or Auditory Nerves.

Next are the *ſeventh* pair to be examined, which by the Ancients (and by all untill Dr. *Willis* altered the account) were reckoned for the fifth pair. Theſe are employed about the Senſe of *Hearing*, and are therefore called the *Auditory* Nerves. They take their riſe in Humane Bodies (according to Doctor *Willis*) out of the lower ſide of the Annular or ringy protuberance of the Cerebel; but I am ſure they do not ſo in Horſes, in whom I have always found them to ariſe from the ſides of the oblong Marrow.

They have each of them two *Proceſſes*, one ſoft and the other harder; which diſtinction of them makes many be of the opinion that they are indeed two pair of Nerves, though uſually they are accounted but for one.

The *ſofteſt* of theſe two Proceſſes is properly called the *Auditory Nerve*, the which is carried through an hole of *os Petroſum* (or the craggy Bone) into the Cells of the Ear, which it cloaths with a moſt thin Membrane, and by which the ſounds are conveyed to the common Senſory.

The *harder* part or proceſs of the Nerve is ſaid to conduce more to Motion than Senſe; which paſſing out alſo through its proper hole in the aforeſaid Bone doth immediately receive a twig from the eighth or wandring pair; after which it is ſtreight divided into two branches; the firſt of which tending downward is beſtowed on the Muſcles of the Tongue and the Bone *Hyoides*; the other winding about the auditory paſſage and bending more upwards, is divided into *three* Shoots; the *firſt* of which anſwering to the Nerve of the former diviſion, beſtows certain

ſlips

ſlips on the Muſcles of the Lips, Mouth, Face and Noſe, and ſo actuates ſome of the outward organs of the Voice, as the former doth ſome of the inner. The *ſecond* of theſe Shoots being divided into many other leſſer, is ſent into the Muſcles of the Forehead, as alſo to the Eye-lids. And the *third* or laſt of them doth run towards and ſpreads it ſelf into the Muſcles of the Ears. Whence upon any unuſual and aſtoniſhing ſound the Ear is by a natural inſtinct prickt up, to liſten to it the more attentively, and at the ſame time the Spirits flowing by other branches of this Nerve into the Muſcles of the Eye-lids, cauſe them to be drawn as far aſunder as is poſſible, that the Beaſt may have the clearer view of any threatning danger; which poſture of the Eyes we call *ſtaring*.

CHAP. X.

Of the eighth and ninth pair of Nerves.

THE next pair of Nerves we are to treat of are the *eighth*, (commonly reckoned for the *ſixth*) otherwiſe called the *wandring pair*, from their being diſtributed into many Parts, wandring as it were not onely through the Head and Neck, but through many of the inferiour Parts of the Body both in the Cheſt and Paunch, furniſhing them with Nerves branching from them. *The eighth or wandring pair.*

Theſe Nerves do alſo ariſe out of the oblong Marrow a little below the Auditory Nerves. Their root or beginning conſiſts of many Fibres, ſome of which are ſmaller and ſome thicker, to which is added a notable Fibre or rather Nerve, much greater than the reſt, coming from the Spinal Marrow of the Neck, which is joined with them and wrapped about with one and the ſame Coat taken from the *dura mater*, as if they were but one Nerve. They continue to be thus united till they have paſt without the Skull, after which they are diſperſed to ſeveral Parts. The Acceſſory Nerve is diſtributed to the Muſcles of the Neck and Shoulders; and one notable Fibre of the eighth pair joins it ſelf on each ſide to the harder Proceſs of the Auditory or ſeventh pair, as alſo two others run to the Muſcles of the Gullet and Neck. But the reſt of the Fibres of the wandring pair continue together, going forward in one Trunk; and inſtead of the other companion lately parted from them (I mean the Spinal or Acceſſory Nerve) they entertain a new one, which is the Intercoſtal, or Nerve of the ninth pair.

In this place where the ſaid Intercoſtal Nerve is united with this Nerve of the eighth pair, there is made a notable *Plexus*, (that is, the Trunk of the Nerve in that place ſwells into a kind of tumour, reſembling the joint or knot of a Cane.) For as the Intercoſtal Nerve is received *into* it, ſo *out* of it there ſprings a conſiderable branch, which being carried towards the Throttle is divided into three twigs; the *firſt* of which is ſtretched out into the ſphincter of the Gullet; the *ſecond* being hid under the Shield-faſhioned Griſtle, diſtributes its Shoots to the upper Muſcles of the Throttle, and particularly to the Muſcle by which the Chink of the

Throttle is ſhut up. The *third* of theſe ſhoots or twigs going alſo under the Shield-faſhioned Griſtle, meets the top of the Recurring Nerve and is united with the ſame.

Below the aforeſaid inoculating of the Intercoſtal with the wandring pair, which makes that *Plexus* before-named, the Trunk of this latter goes ſtreight down by the ſides of the aſcending Carotid Artery, on which it beſtows ſome ſlips, and at the bottom of the Neck it ſends out another twig into the Recurrent Nerve, but this it does onely on the left ſide.

From hence the Trunk of the wandring pair deſcends without any noted branchings till it comes over againſt the firſt or ſecond Rib, where out of a ſecond *Plexus* many ſhoots and numerous Fibres are ſent forth towards the Heart and its appendages, but not altogether in the ſame manner on both ſides. Doctor *Willis* ſays, many more branches are ſent from this pair towards the Heart in Beaſts than in Men; for in theſe latter there are a great many twigs ſent thereto from the Intercoſtal pair, whereas there are very few in Brutes; ſo that in both, the plenty of the one ſupplies the defect of the other.

There is (ſaith the ſame Authour) one notable difference worthy of note, of the two Recurrent Nerves that ſpring out of the Trunk of this eighth pair, *viz.* that that on the right ſide ariſes out of it higher, and winds about the Axillar Artery; whereas that on the left ſprings much lower therefrom, and twiſting about the deſcending Trunk of the *Aorta*, returns back from thence, and aſcends upwards where in its progreſs it ſends forth ſhoots to divers Parts.

And that obſervation of the ſaid Doctor is worthy to be taken notice of, *viz.* That the Nerves that paſs towards the Heart of Brutes are much fewer in number than thoſe in Men, of which (as alſo of their proceeding chiefly from the wandring pair) he gives this ingenious reaſon; That ſeeing Beaſts want prudence, and are not much liable to various and divers paſſions, it was not therefore neceſſary that there ſhould be two ways of deriving the Spirits from the Brain to the *Præcordia*, namely one to bring Spirits to maintain the exerciſe of the vital function, and the other to miniſter to the impreſſions of the affections; but it is ſufficient that all the Spirits, for whatſoever office they are deſtin'd, ſhould be conveyed thither by one and the ſame path.

Over againſt the Heart, the *Trunk* of the wandring pair ſends forth many notable branches on either hand, which paſſing to the Lungs, are diſtributed through their whole ſubſtance along with the Bloud-veſſels and branches of the Wind-pipe, which they climb upon and twiſt about: and as it deſcends by the ſides of the Wind-pipe, it diſtributes alſo many ſlips into the Coats of the Gullet. After theſe branches have grown out of theſe Nerves, then is each Trunk, as it deſcends by the Gullet, divided into an *outer* and *inner* branch: but preſently the outer branches unite with the outer, and the inner with the inner; and being ſo united, the *former* deſcends by the outſide of the orifice of the Stomach to its bottom, where it diſperſes it ſelf; and the *latter* deſcending by the inſide of the orifice of the Stomach, turns back there, and creeps along its upper part. To what other Parts the twigs of this eighth or wandring pair are extended, the Reader may learn in the deſcription of the Parts themſelves, in treating of which we have conſtantly obſerv'd to ſhew from whence their Nerves were derived.

After

After the *wandring* or *eighth* pair, by order of diſſection the *ninth* and laſt pair of Nerves that ſpring from within the Skull are to be ſpoken to. Concerning the riſe of which pair, there are various opinions; for ſome there be that will have them onely branches of the wandring pair, and that they take their beginning from them: but that opinion is rejected, ſince it is now made very apparent that they have another original, of which the often before-cited Doctor *Willis* was the firſt diſcoverer, whom I may be bold to follow, ſince none have given, nor 'tis probable can give a better account of them than that Learned man, who ſaith that the beginnings, (as alſo the different Trunks in the progreſs) of theſe Intercoſtal Nerves are eaſily diſtinguiſhed from the former, notwithſtanding they do often communicate or join together by branches ſent forth from one to the other. *The ninth or intercoſtal pair.*

But though they owe not their original to the wandring pair, and much leſs are to be reputed as branches of them, yet have they no proper root of their own, but do borrow their original from two or three recurring branches of the fifth and ſixth pairs near their origine, growing out of them as a Shrub upon another Tree or Shrub.

Theſe Nerves thus conſtituted do afterward run out of the Skull by their proper holes, and preſently on each ſide form a *Plexus* near that of the wandring pair, into which two Nervous Proceſſes out of the firſt vertebral pair are inſerted, and out of which there goes one twig or ſlip into the Sphincter of the Gullet, and another into the *Plexus* aforeſaid of the wandring pair. Whence deſcending by the *vertebræ* of the Neck, by that time they arrive at its middle, they have each another greater *Plexus*, into which a large Nerve from a neighbouring vertebral pair is inſerted, and from which proceed ſome twigs that uniting with others of the wandring pair are diſtributed all about the *Præcordia*, (that is, to the Heart and Lungs) as alſo one ſingle one a little lower. 'Tis true, Doctor *Willis* affirms that this *Plexus* laſt ſpoken of is *proper to Man onely*; but ſince I find ſo little difference in the other Parts between a Man and the Animal I am treating of, I ſuſpend my belief whether this *Plexus* may not be found in him alſo, though I have not been yet ſo diligent as to make any exact inquiry into it.

This *Plexus* is called the *Plexus cervicalis*, becauſe it is formed in the Neck; whence the Trunks of this Intercoſtal pair deſcending by the *Claviculæ* or Chanel-bones into the Cheſt, as ſoon as they have arrived at the ſecond Rib, each of them receives three or four branches from the Vertebral Nerves next above, whereby is made another notable *Plexus*, commonly called the Intercoſtal. From whence as its Trunks paſs down by the roots of the Ribs, in every one of their Interſtices, and even as low as the *Os ſacrum* from every jointing of the *Vertebræ* each Trunk receives a Vertebral Nerve.

As ſoon as they are deſcended out of the Cavity of the Cheſt, and are come over againſt the bottom of the Stomach, they ſend forth on each ſide a notable branch, each of which tending towards the Meſentery makes its chief *Plexus's*, being in number ſeven, *viz.* five large ones which are *upper*, and two leſs that are *lower*. For each branch is preſently divided into two other, and every one forms one *Plexus*, which make four; and the fifth is in the middle of theſe, being the largeſt: and theſe are the five *upper*.

The two *lower Plexus* are framed of two branches that ſpring from the Trunks deſcended as far as the lower part of the Loyns, and are diſtinguiſhed by the names of *Plexus infimus*, and *minimus*, (*i. e.* the loweſt, and the leaſt) which two *Plexus* do furniſh ſeveral Parts of the Lower Belly with Nerves.

Laſtly, When this Intercoſtal pair have deſcended as low as the *Os ſacrum*, and have furniſhed in their courſe the ſeveral Parts of the Lower Belly with Nerves, they bend towards one another and ſeem to be knit together by two or three Proceſſes, and at length each of them ends in ſmall Fibres which are diſtributed into the Sphincter Muſcle of the Arſe.

Thus have I given a deſcription of the ſeveral pairs of Nerves ariſing within the Skull, in deſcribing of which I muſt own my ſelf obliged to ſeveral worthy Authours, whoſe Doctrine I have been forced much to follow and relie on in this particular, having not as yet made a thorow inſpection into theſe moſt curious Inſtruments of the Animal Faculty my ſelf: the chiefeſt of which Authours and whom I have moſt followed, is that accurate Tracer of them, Doctor *Willis*, to whom all that have treated of theſe Parts ſince him, have been ſo much beholding. But onely where he aſſigns ſome differences betwixt the courſe of the Nerves in Men, and *all* Brutes *in general*, I cannot eaſily acquieſce in his opinion in relation to a Horſe, the frame of whoſe Body comes almoſt in all reſpects ſo near to that of a Man's; however, till I have made a more exact ſcrutiny, I ſhall forbear contradiction.

Table XXVI.

Shews the baſis or bottom of the Brain of an Horſe taken out of the Skull, having the *dura mater* removed, the better to ſhew the riſe of all the Nerves, and the other Parts of the bottom of the Brain.

AAAA *Shew the ſubſtance of the baſis or bottom of the Brain.*
BB *The Cerebel or After-brain placed in the hinder part of the Head.*
CC *The Oblong Marrow.*
DD *The Smelling Nerves, being the firſt pair.*
EE *The Optick Nerves, being the ſecond pair.*
FF *The third pair of Nerves, which move the Eyes.*
GG *The fourth pair of Nerves, by Doctor* Willis *called the* Pathetick Nerves.
HH *The fifth pair.*
II *The ſixth pair.*
KK *Doctor* Willis *his ſeventh pair, being the Auditory Nerves, which went formerly for the fifth pair.*
LLll *The eighth pair of Nerves, called otherwiſe the wandring pair, which before Doctor* Willis *were reckoned for the ſixth pair.*
MM *The Spinal Nerves, or Acceſſory pair, that unite with the wandring pair.*
NN *The ninth pair.*
OO *The tenth pair (or rather the firſt of the Neck) ariſing from the further or hinder part of the Oblong Marrow near its going out of the Skull.*
PP *The Trunk of the Carotid Artery cut off where it is divided into the fore and hinder part.*

TAB. XXVI.

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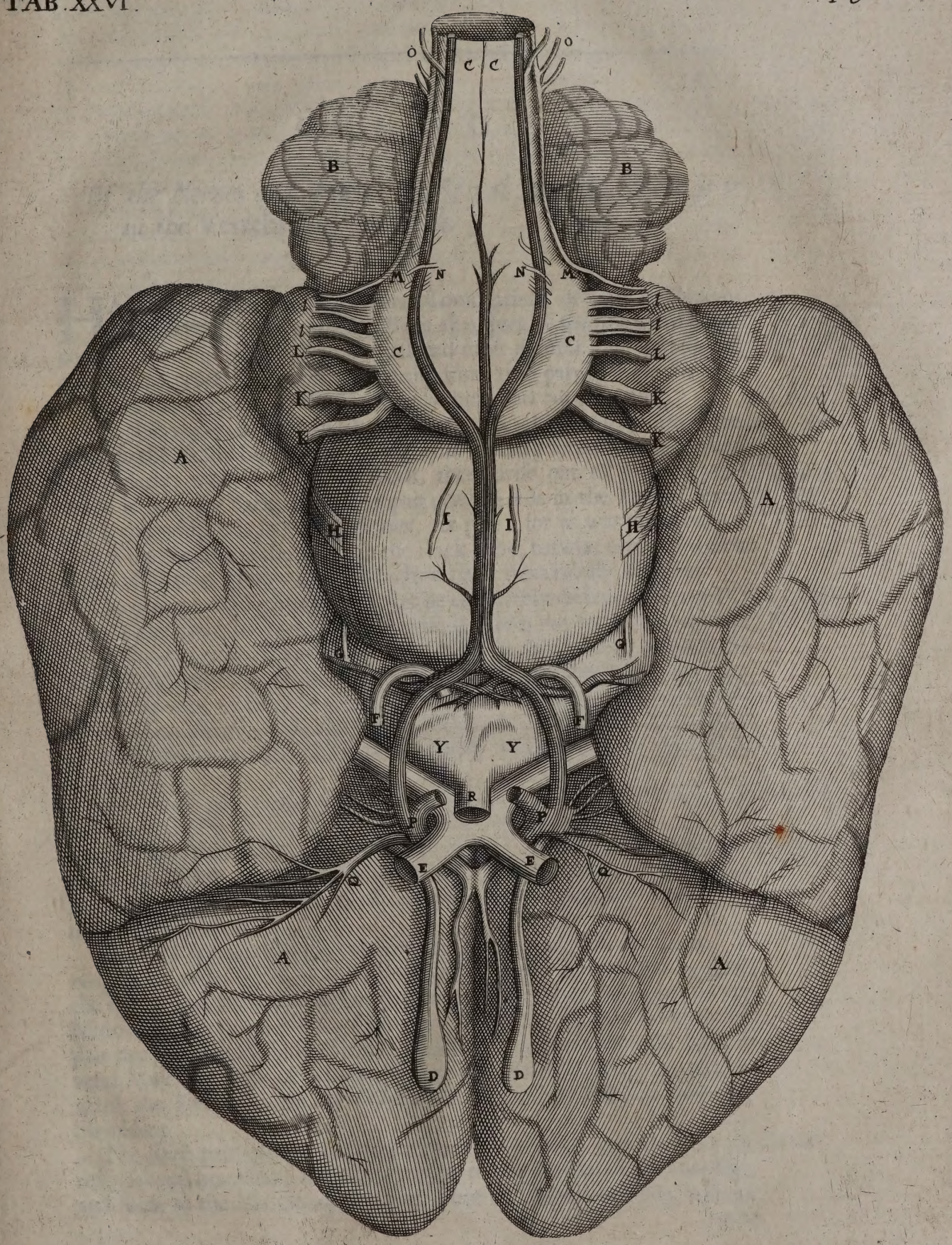

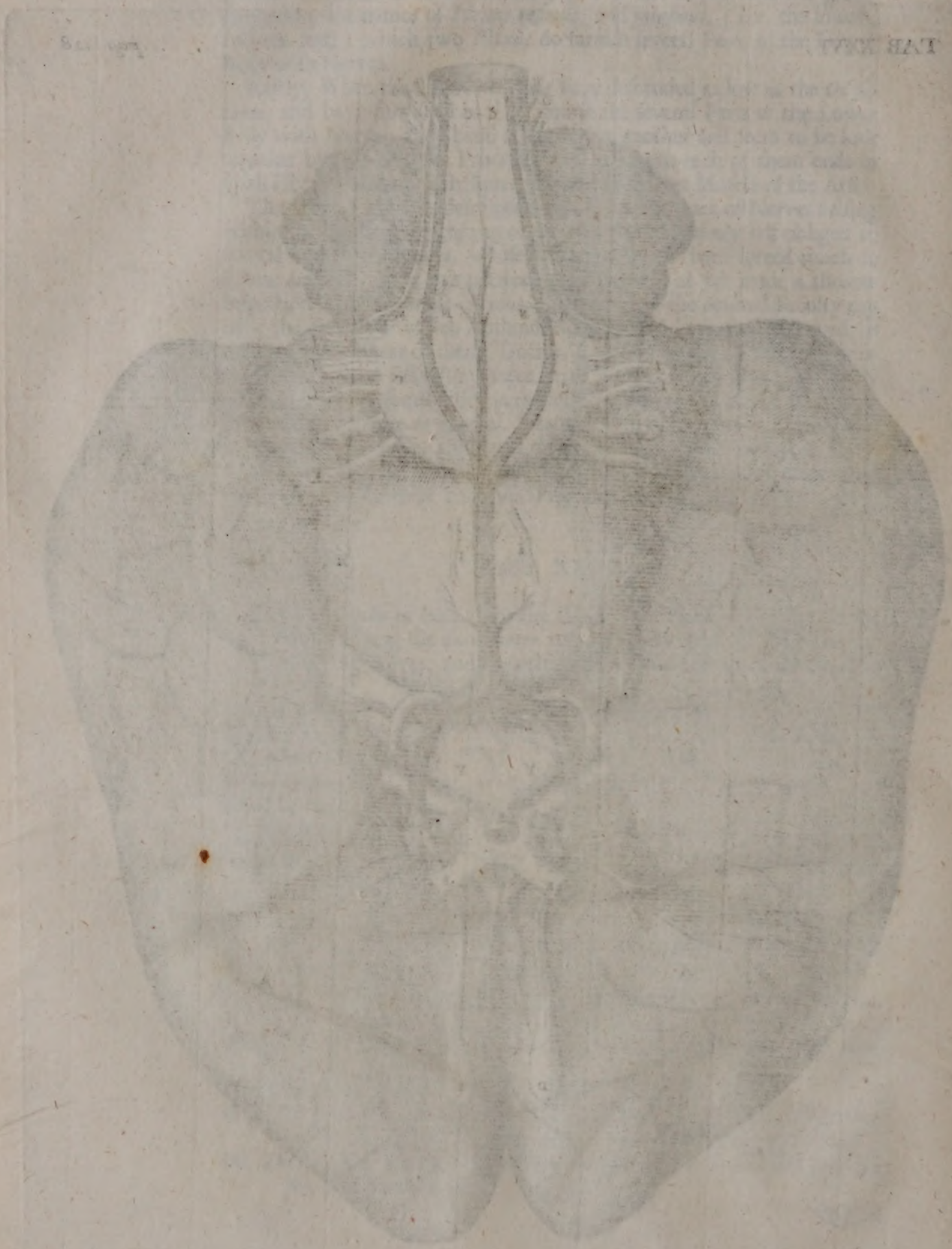

QQ *A branch of it going into the ſubſtance of the Brain.*
R *The* Infundibulum *or Funnel.*
SS *Two Glands or Kernels placed behind the Funnel.*

CHAP. XI.

Of the Nerves ariſing from the Spinal Marrow, while it is in the Vertebræ *of the Neck.*

HAVING treated of the ſeveral Conjugations or Pairs of Nerves which take their beginning from that part of the Spinal Marrow contained *within* the Skull, the uſual and moſt natural method requires me next to proceed to thoſe that ſpring from that part of it that is contained in the *Vertebræ* of the Neck and Chine without the Skull.

Thirty ſeven pair of Nerves ſpring out of the Spinal Marrow.

We obſerved in a Chapter above, that in its whole progreſs from the Skull to the Rump-bones there ſpring from it thirty ſeven pair of Nerves. Particularly, while it is in the Neck, there ariſe out of it ſeven pair; while it is in the Back, ſeventeen pair; while it is in the Loyns, ſeven pair; and while it is in the *Os ſacrum*, ſix pair: for as was noted before, ſuch is the number of the Joints in the Rack-bone, betwixt every of which a pair of Nerves iſſues. Of all which we will treat briefly in order.

The firſt pair of the Neck.

The *firſt* pair of the *Neck*, though it be commonly reckoned among the pairs of the Spine or Rack-bone, becauſe it comes out from between the firſt *Vertebra* and the Skull; yet if we conſider its riſe, it ought rather to be reputed the *tenth* pair of the Brain; for it riſes with many Fibres from the Spinal Marrow while it is yet within the Skull, but preſently after its riſe tends backwards or downwards, (whereas all the reſt that ariſe within the Skull go forwards.) This pair is chiefly beſtowed on the Muſcles of the Neck.

The ſecond.

The *ſecond* pair comes out between the firſt and ſecond *Vertebræ* of the Neck, and is beſtowed upon the Neck, Head and Face.

The third and fourth.

The *third* and *fourth* pair come forth of the holes that are between the ſecond and third, and the third and fourth *Vertebræ*, and are ſpread into the Muſcles of the Cheeks, as alſo into the Muſcles that are common to the Head and Neck.

The fifth.

The *fifth* ſpringeth forth between the fourth and fifth *Vertebræ*. A twig from each Nerve of this pair, being joined with the like twigs of the fourth and ſixth, do make that remarkable Nerve that goes to the Midriff, and is called *Nervus Phrenicus*. The other branches of this fifth pair are diſtributed ſome of them backward and ſome forward into ſeveral Muſcles; ſome of which do bow the Head; other twigs run toward the Fore-legs, and are diſtributed into ſeveral Muſcles about the Shoulders.

The ſixth.

The *ſixth* pair cometh out under the fifth *Vertebra*, and hath, as the reſt, ſeveral branches; ſome of which go to the Muſcles of the Fore-legs, and ſome to the Muſcles of the Neck; but one particular twig helps to make

make up the Trunk of the *Nervus Phrenicus*, joining it ſelf with the aforeſaid twigs of the fourth and fifth pairs.

The ſeventh. The *ſeventh* pair cometh out of the hole common to the ſixth and ſeventh *Vertebræ*, which joining with the foregoing pair, *viz.* the ſixth of the Neck, and likewiſe with the two following, *viz.* the two firſt of the Cheſt, is diſperſed into ſeveral Muſcles of both the Shoulders, alſo to the Neck and Cheeks.

The Acceſſory Nerve, that aſcends to the Brain, and unites with the wandring pair. About where this ſeventh pair of Nerves ariſes, there ſprings another, found out by Doctor *Willis*, and by him called *Nervus ad par vagum acceſſorius*, which aſcends up by the ſides of the Spinal Marrow (growing in its courſe thicker and thicker) untill it reach up to the Skull, during which way it continues in one body without ſending any branches to any Part. When it has entred the Skull, it then joins it ſelf with the Fibres of the eighth pair of the Brain called the wandring pair, with which it takes its progreſs out of the Skull, but preſently after ſeparates from them, and is diſperſed into the Muſcles of the Neck and Shoulders, as was ſhewed before in the foregoing Chapter, while we diſcourſed of the wandring pair.

CHAP. XII.

Of thoſe Nerves that ariſe out of the Spinal Marrow whilſt it is in the Vertebræ *of the Back, Loyns, and* Os ſacrum.

FROM the Marrow of the Back proceed ſeventeen pair of Nerves, there being in an Horſe ſo many Spondyls or Back-bones; which number exceeds that of the Joints of the Back in Humane Bodies, there being in *them* but twelve, and ſo accordingly they have no more than twelve pair of Nerves from the Marrow within the Back.

The firſt pair of the Back. The *firſt* of theſe pairs ſpringeth out of the hole which is common to the laſt *Vertebra* of the Neck and the firſt of the Cheſt: Each of them (as are likewiſe all the following) is preſently divided into two branches, of which the *formore* is larger than the *hinder*. The *formore* joineth it ſelf with the two laſt of the Neck, and ſo goeth the greateſt part of it to the Fore-legs; onely one little twig that ariſeth out of it before ſuch conjunction, is beſtowed upon ſome of the Muſcles of the Breaſt and Neck; and the ſmaller which is the *hinder*, is beſtowed upon the Muſcles ſeated on the Back.

The ſecond pair. The *ſecond* pair ſprings out between the firſt and ſecond *Vertebræ* of the Cheſt, whoſe *formore* branch being united with the firſt of the Cheſt, together with it is joined with the ſixth and ſeventh of the Neck, which all together make one *Plexus*, out of which proceed moſt of the Nerves that are inſerted into the Muſcles of the Shoulders and Fore-legs. But before the aforeſaid formore branch unite with the foregoing, it ſends forth a twig to the Intercoſtal Nerve (or Nerve of the ninth pair) deſcending

cending down the *Thorax* or Cheſt, as alſo do all the reſt of the remaining fifteen pair.

That branch of this pair which is called the *hinder* branch, hath the ſame diſtribution with the hinder of the foregoing pair, and therefore I will omit ſpeaking particularly of it: Neither do I think it neceſſary to treat of every particular of the remaining pairs that proceed from the Marrow of the Back; firſt, becauſe my deſign is to be as brief as poſſible both in theſe and all other Parts, that I may not make my Volume ſwell too big; and in the next place, the remaining pairs coming out of the ſeveral holes betwixt the jointings of the other Bones of the Back as theſe already ſpoken of do out of the former, it would be but repeating almoſt the ſame things over again ſo to deſcribe particularly every pair. I will therefore onely ſpeak thus much of them in general, that after they are come out of their ſeveral holes of the *Vertebræ*, they do each of them immediately divide themſelves into two branches, whereof the *formore* (being, as hath been ſaid, the larger) ſends one twig to the Intercoſtal Nerve, and the remainder of it is beſtowed on the Muſcles between the Ribs, called the Intercoſtal Muſcles, both external and internal, and a few twigs alſo upon the other Muſcles of the Cheſt that lie upon the Ribs; and laſtly, a twig or two on the obliquely deſcending Muſcles of the Lower Belly. The *hinder* and leſſer branches preſently upon the diviſion bend backward to the Spine, and are ſpent upon the Muſcles and Skin of the Back.

The remaining fifteen pair.

Next come we to ſpeak to thoſe Nerves that ſpring from that part of the Spinal Marrow that is contained within the *Vertebræ* of the *Loyns*, which are in number ſeven pair according to the number of Bones in that Part. The *firſt* of which cometh out between the firſt *Vertebra* of the Loyns and the laſt of the Back. Each of them, like thoſe of the Back, is preſently divided into two branches; the *formore* of which is beſtowed upon the fleſhy part of the Midriff, eſpecially its two Proceſſes, and partly on the Muſcle *Pſoas*; and the *hinder* of them is inſerted into the *Muſculus longiſſimus* or longeſt Muſcle of the Back.

The firſt pair of the Loyns.

The *ſecond* pair come out between the firſt and ſecond *Vertebræ* of the Loyns under the Muſcle *Pſoas*; the *formore* of whoſe branches is beſtowed upon the Muſcle that fills up the Cavity of *Os Ileum* or Haunch-bone (which Muſcle is the ſecond bender of the Thigh) alſo a twig of it is ſent to the *Muſculus faſcialis*, and to other neighbouring Parts. The *hinder* branch paſſeth into the Buttock Muſcles, and doth loſe it ſelf in the bodies of thoſe Muſcles.

The ſecond pair.

The *third* pair of theſe Nerves of the Loyns come forth between the ſecond and third *Vertebræ* of the Loyns, from under the Muſcle *Pſoas*, as the former did. The *fore* branch is diſperſed down the hinder Leg to the Cambrel or Hock, furniſhing ſeveral Muſcles about thoſe Parts with Nerves. The *hinder* branch is bent back and diſperſed through the Muſcles of the Loyns, ſupplying them with Nerves.

The third pair.

The other four pair of theſe Nerves of the Loyns, like the former, come forth from between the other four *Vertebræ* of the Loyns. Their *fore* branches are diſperſed into moſt of the Muſcles of the Buttocks and hinder legs; alſo ſome twigs are ſent from them to the Muſcles that raiſe the Yard, ſome others to the neck of the Bladder; and in Mares ſome twigs are ſent to the *Matrix* or Womb. And the *hinder* branches are carried backward, and are beſtowed upon ſeveral Muſcles of the Back.

The remaining four pair.

In the next place I come to treat of the remaining Conjugations or pairs of Nerves that ſpring from the Spinal Marrow, which are thoſe that come forth of the holes of *Os ſacrum*, and are in number ſix pair, there being in the ſaid Bone ſix *Vertebræ*, with pretty wide holes for the coming forth of the Nerves.

The firſt pair of Os ſacrum.

The *firſt* of theſe pair iſſueth out between the laſt *Vertebra* of the Loyns and the firſt of *Os ſacrum* in the ſame manner as thoſe that ſpring out of the *Vertebræ* of the Loyns, and like them is divided into two branches; the *foremoſt* of which is a great part of it mixed with thoſe other of the *Loyns*, and with them runs down to the hinder Legs, ſupplying ſeveral Muſcles of thoſe Parts with Nerves. And the *hinder* furniſheth the biggeſt Buttock-muſcle and other Parts thereabouts with Nerves.

The remaining five pair.

This pair of Nerves, as I have ſaid, come out ſide-ways like the Nerves of the Loyns, and are divided like them afterwards into a *fore* and a *hinder* branch; but the other five pair come out before and behind; but before they go out of the Bone, they are on each ſide double, and on each ſide one Nerve goes into the fore-parts and the other into the hinder. Thoſe that go into the hinder-parts are diſperſed as thoſe of the Loyns were, that is, into the Muſcles that lie upon the *Os ſacrum*, and *Ileum*; but thoſe that go into the fore-parts are diſperſed into ſome Muſcles on the fore-part of the Thigh; alſo ſome twigs of them are ſent to the Cods, the Bladder, and to the Muſcles of the Fundament.

Table XXVII.

Repreſents all the Nerves of the whole Body, as well thoſe that ariſe from the Oblong Marrow within the Skull, as thoſe that ſpring from the Spinal Marrow without the Skull, (taken out of a French Authour.)

AAAAAA *Moſt of the Nerves that ſpring from the Oblong Marrow within the Skull.*

B *The ſaid Oblong Marrow.*

CC *The Eyes with the optick and moving Nerves branched to them, the one making their Coats, and the other ſerving to move them.*

DD *Doctor* Willis *his eighth pair or the wandring pair of Nerves, with their courſe through the Middle and Lower Belly.*

From the Figure or Cipher 1 *to* 7. *are ſhewn the Nerves that ſpring from the Spinal Marrow while it is in the* Vertebræ *of the Neck.*

From the Figure 1 *to* 17. *are ſhewn thoſe that ſpring from it while it is in the* Vertebræ *of the Back.*

From the Cipher 1 *to* 7. *are ſhewn thoſe that ariſe out of it while it is contained within the* Vertebræ *of the Loyns.*

From the Cipher 1 *to* 6. *are ſhewn thoſe that ariſe out of it while it is in the* Os ſacrum, *which Nerves are branched into all the hinder Parts and down the hinder Legs, imparting to them both Senſe and Motion.*

Thus have I given a brief deſcription of the ſeveral Conjugations or Pairs of Nerves that ſpring from the Spinal Marrow, ſhewing where they ariſe, which way they paſs, and to what Parts they run; which may

TAB XXVII

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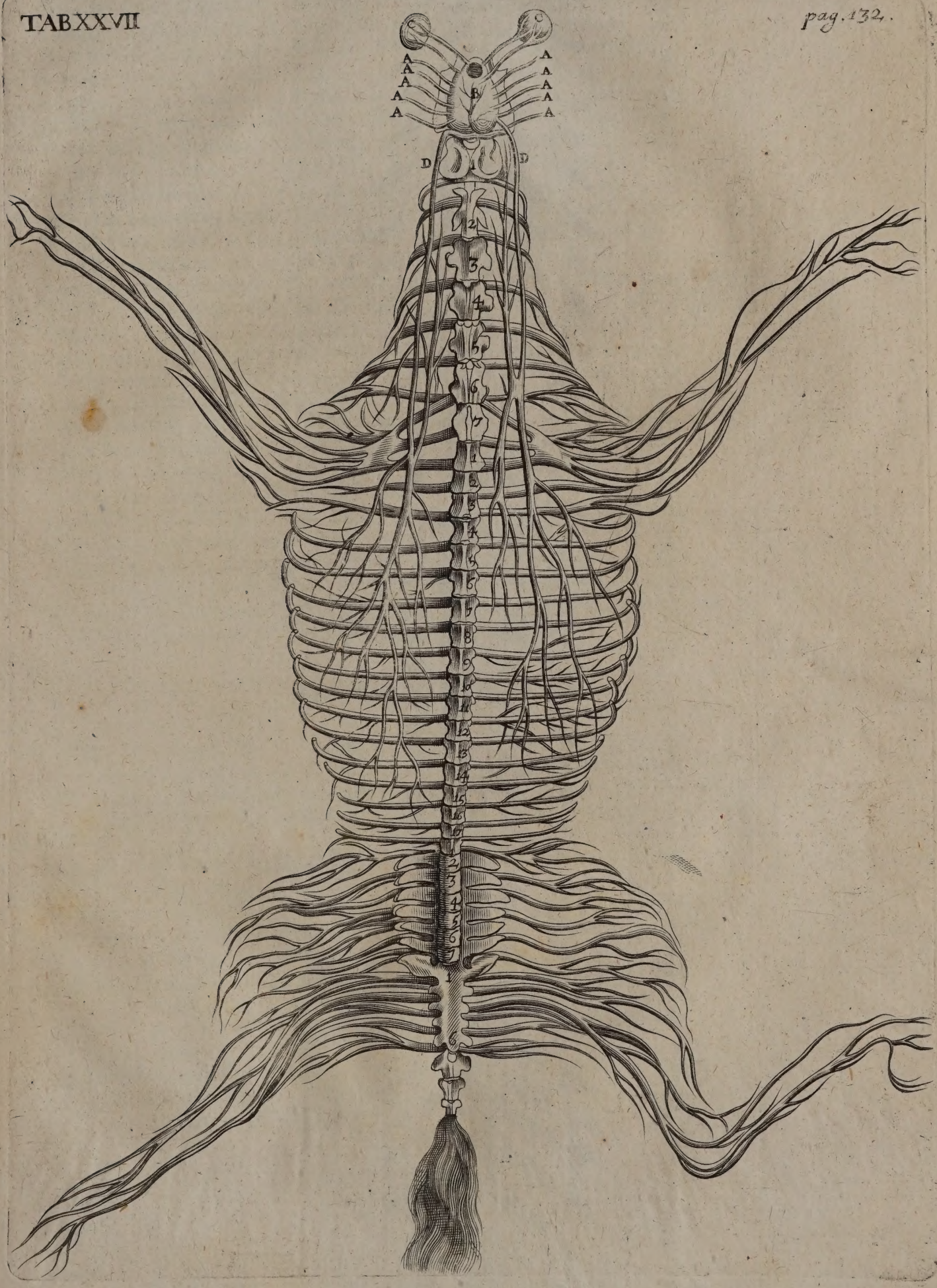
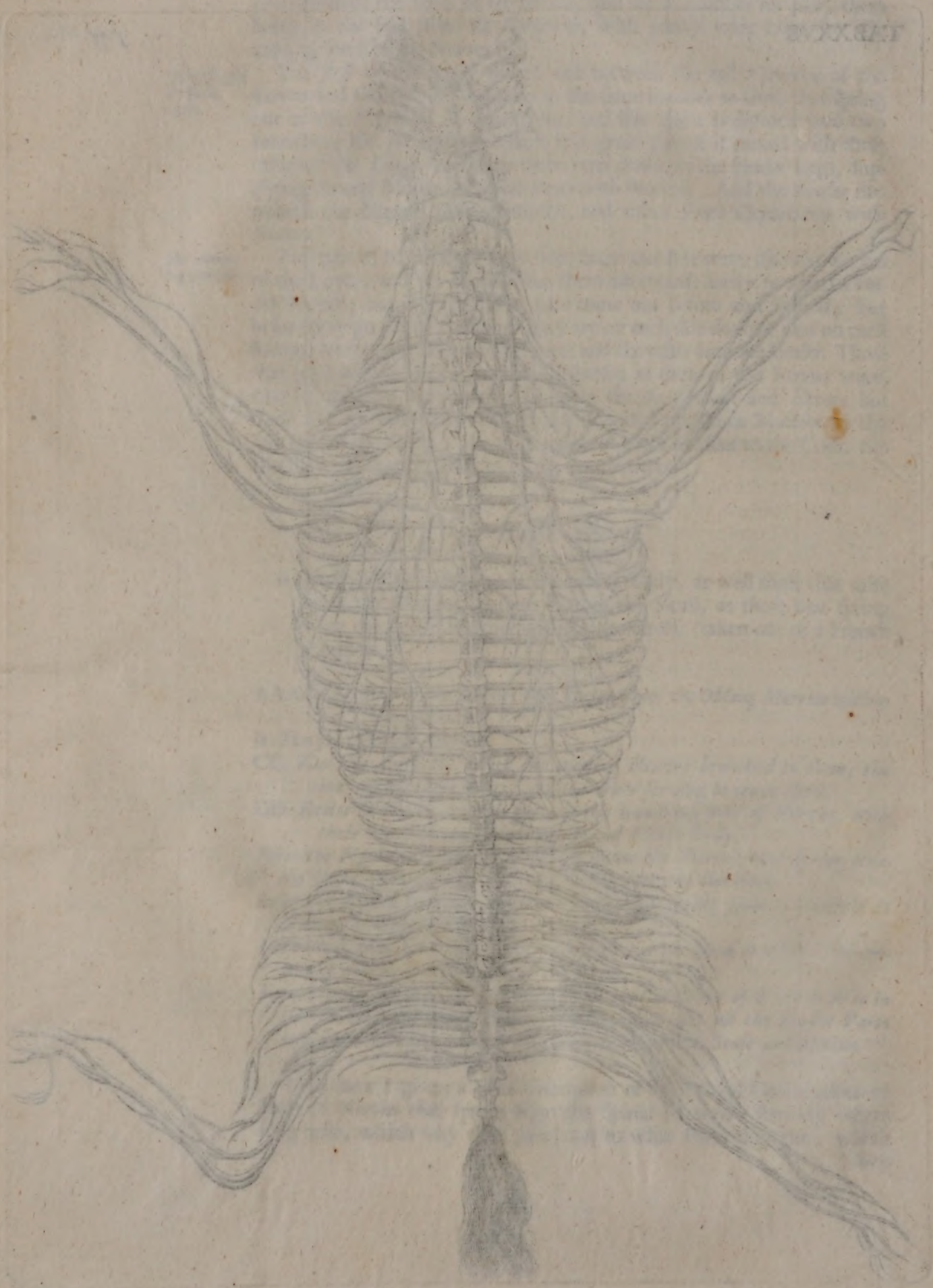
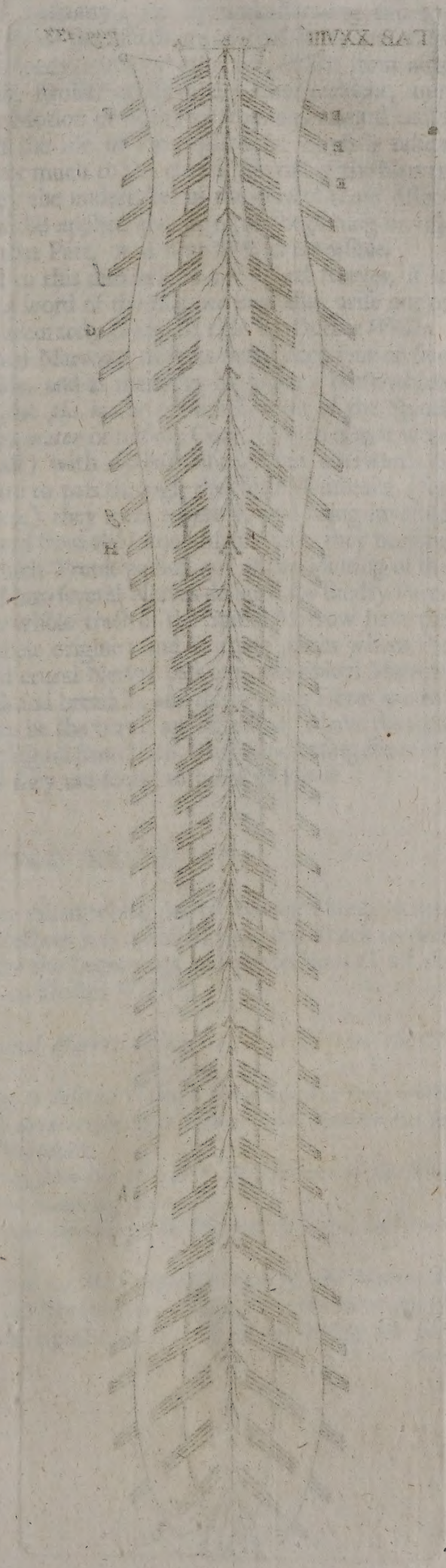
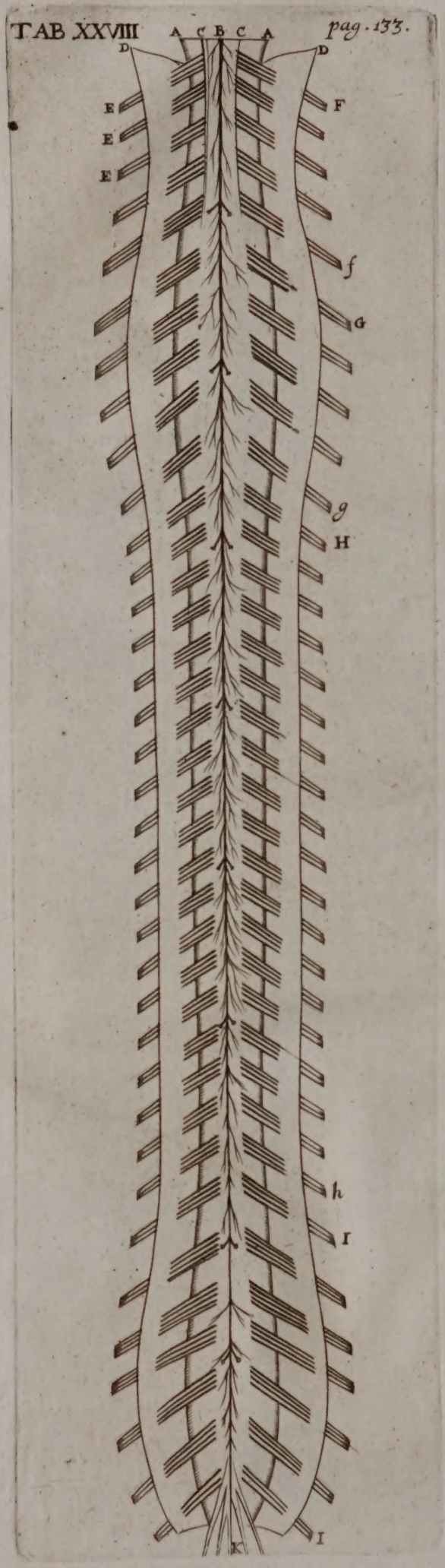






TAB XXVIII



may be of great uſe to our Practitioners, if they will but take the pains to inquire into this part of Anatomy; for by underſtanding the beginning or riſe of the Nerve that furniſheth an affected Part, one may learn where to apply the Remedy. As for inſtance; When from any outward cauſe, as from a fall, ſtroke, bruiſe or any other accident, any Part hath loſt either Senſe or Motion or both; or from any inward cauſe a Palſie happens, by which the uſe of ſome particular Limb is taken away; it would conduce very much to the cure if the riſe of the Nerves of ſuch Part were known by the undertaker of the cure of thoſe Affections; for the Medicine is to be applied always to the beginning or riſe of that Nerve that paſſes to that Part, or as near to it as is poſſible.

I ſhould here put an end to this diſcourſe of the Spinal Nerves, if it were not convenient to add a word of the manner how they ariſe out of the Marrow, which is very accurately deſcribed thus by Doctor *Willis*.

How the Nerves ſpring out of the Spinal Marrow.

"On each ſide of the Spinal Marrow, near its outer edge four or five "Fibres ariſe in its upper ſide, and as many in its lower: both which "companies penetrate firſt the *pia mater* or inmoſt Coat of the Spinal "Marrow, and then the *dura mater* or middle Coat, (which is as it were "a common caſe to them all) with *diſtinct* Fibres: but afterwards as "both companies of Fibres are to paſs through the third Membrane (for "the Spinal Marrow has three) they meet together, and being inveſted "with the Coat they borrowed from the ſecond Membrane, they become "as it were one Trunk: which Trunk paſſing out of the jointing of the "*Vertebræ*, is again divided into ſeveral Nerves deſign'd for ſundry Parts. "After this manner in the whole tract of the Spinal Marrow have the "ſeveral vertebral Nerves their origine; and in thoſe places where the "brachial (*or fore-leg*) and crural Nerves paſs out, the Spinal Marrow "encreaſes both in thickneſs and breadth, and the nervous Fibres are lar-"ger. All which that it may be the better apprehended, I have thought good to annex the following Figure from Him, onely encreaſing the number of the pairs of Nerves as they are found to be in an Horſe.

Table XXVIII.

Shews the Spinal Marrow taken whole out of the Rack-bone, where the Membrane that cloatheth it is diſſected and turned back on each ſide, the better to ſhew the beginnings and productions of all the vertebral Nerves, (from Doctor *Willis*.)

AA *Shew the top of the Spinal Marrow, where it is cut off from the Oblong Marrow.*

B *The Spinal Artery ſeeming to deſcend through the whole Marrow, which however is made up of Arteries brought into it from between the ſeveral jointings of the* Vertebræ.

CC *The Spinal Nerve coming from the fifth or ſixth* Vertebra *of the Neck to the beginning of the wandring pair.*

DD *Portions of the Membrane cloathing the Marrow diſſected and turned back.*

EEEE *The Spinal Nerves ſent out of the upper margin of the Marrow by bands, with which the like bundles ſpringing from the lower margin alſo meet, and join together all into one Trunk* within *the junc-*

tures of the Vertebræ, *then being ſeparated again* without *them, they are carried into their reſpective provinces.*

Ff *Nerves ſpringing within the region of the Neck.*

Gg *Nerves deſtinated for the Shoulders and Fore-legs, where both the Marrow is thicker in bulk, and the Nerves greater.*

Hh *Nerves going out about the Back and Loyns, where both the body of the Marrow is again become ſmaller, and the Nerves are ſomewhat ſlenderer.*

Ii *Nerves deſtinated for the Buttocks and hinder Legs, where both the Medullar body and the Nerves are again larger.*

K *Nerves going out of* Os ſacrum.

CHAP. XIII.

Of the Eye-lids, Eyes and their ſeveral Parts, viz. *their Coats and Humours.*

The Eyes, their name. THE *Eyes* are termed in Latin *Oculi*, from the word *occludo* to ſhut, or from *occulto* to hide, becauſe they are hid by the ſhutting of the Eye-lids. They are the Organs or Inſtruments of Sight, conſiſting of many Parts, *viz.* of Humours, Membranes, *&c.*

Their number. Their *number* is by all People known to be two, and that for the ſecurity and perfection of ſight; that if one be defective, or ſhould by accident be loſt, the other may ſupply its place and office, though not altogether ſo perfectly.

Their figure. The Eye alone, when its Muſcles, and the Nerves and Bloud-veſſels that enter into it, are removed, is of a round figure, both that it might move the better, and alſo that it might the better receive the viſible Rays.

Their Parts. Adjoining unto the Eyes are the *Eye-lids*, which contain them as it were, and ſerve as a ſafeguard or cover to preſerve them from external injuries: United with them are the Fat and Muſcles: and laſtly the Parts that conſtitute the Eye it ſelf are the Membranes, Humours, and Veſſels.

The Eye-lids. The *Eye-lids* do ſerve as Curtains to the Eyes, by which duſt, Flies, or any thing elſe that might annoy them, is kept out. They are made up of the Skin, the *membrana Carnoſa* or fleſhy Pannicle, and Muſcles; but both the Muſcles and fleſhy Pannicle are in theſe Parts very thin. On the inſide next the Eye they are lined with a Membrane that is propagated from the *Pericranium*, which is very ſmooth, that it may move glibly upon the Eye. The extremities or edges of the Eye-lids are hard and griſtly, partly to ſtrengthen them, and partly that they may meet the more exactly, and not fall one over the other. And thus much ſhall ſuffice for the outward or containing Parts of the Eyes, *viz.* the Eye-lids.

As for the *Muſcles*, we ſhall defer ſpeaking of them till the next Book. And as to the *Fat*, it differs not from that which is intermixed among the Muſcles in other Parts, and ſerves here to keep the hinder-part of the Eye and parts adjoining moiſt, that the Eye may move the more glibly in its Socket.

We

We ſhall therefore next proceed to the Eye it ſelf, and deſcribe the Parts of which it conſiſts, and firſt its Tunicles or Coats, the firſt or outmoſt of which is a *common* Coat, ariſing from the *Pericranium*, and is ſpread over all the white of the Eye. By this is the Eye kept firmly within its Socket or Orbit. It is of exquiſite ſenſe, and hath many ſmall Arteries and Veins creeping through it, which are very diſcernible when there is any inflammation in that Part. It is called *Adnata.* *The Tunicles of the Eyes.* 1. Adnata.

This *Adnata* being removed, the *proper* Tunicles or Coats do appear, being in number three; the firſt of which from its hardneſs is called *ſclerotica.* This ariſes from the *dura mater*, or (which is all one) from the outmoſt Coat of the Optick Nerve. It is ſomewhat hard, and opaque on its backſide; but on its fore-part, becauſe it is tranſparent like an Horn, it loſes its name of *ſclerotica* which it had from its hardneſs, and is called *tunica cornea* or horney Coat from its clearneſs. 2. Sclerotica.

The *ſecond* proper Coat lieth next under this, and goeth by the name of *Choroides*, becauſe it reſembles that Membrane that inwraps the Foal in the Womb, called *Chorion.* As the former did ariſe from the *dura mater*, ſo doth this from the *pia mater*, (or if you will, from the inner Coat of the Optick Nerve.) All over the back-part of the Eye, this Coat on its inſide is blackiſh, that the Idea's received in might appear the more illuſtrious. 3. Choroides.

This Coat is perforated before as wide as the *pupilla* or ſight of the Eye is in compaſs, to permit the rays of viſible Species to paſs in to the cryſtalline Humour. Which fore-part, becauſe ſo much of it as is from under the white is ſomewhat of the colour of a Grape, is called *uvea:* by which name the fore-part of this Coat is diſtinguiſhed from its hinder-part, as the former was by the name of *cornea*, from *ſclerotica*; which I thought fit to take notice of in this place, that the Reader might not take the four names for four ſeveral Coats, when they are but two, and ſo might go about to find what indeed there is not.

From the circumference of the *uvea*, where its duplicated Membrane bends it ſelf back to the cryſtalline Humour, there is formed a Ligament called *ligamentum Ciliare*, becauſe it conſiſts of ſlender Filaments or Fibres like the hairs that grow upon the Eye-lids in Humane Bodies, running like ſo many black lines from the circumference of the *uvea* to the ſides of the cryſtalline Humour; which Humour they encompaſs, and widen or conſtringe it as there is occaſion, by contracting or opening the perforation of the *uvea.*

The *third* or inmoſt proper Tunicle of the Eye is called *Retina* or the Net-faſhioned Coat, becauſe it encompaſſes the vitreous or glaſſey Humour like a Net. 4. Retina.

This Coat is made of the medullar ſubſtance of the Optick Nerve, being very thin, and rather of a dark than lightſom colour, mixed with an obſcure redneſs. Its figure is ſemicircular, round on its outſide, and hollow within, containing in it the vitreous Humour, and receiving into its boſom the cryſtalline Humour alſo, having its Fibres extended as far as the *ligamentum Ciliare*, to which theſe Fibres afford animal Spirits for the continuance of its motion. It is obſerved that if this Coat be taken and put into warm Water, ſhaking it a little to waſh off the mucous or ſnotty matter that cleaves to it, and then be held up to the light, the Fibres or Filaments will appear very numerous like the threads of the fineſt Lawn.

Having

The Humours of the Eyes.

Having done with the *Tunicles* or Coats of the Eyes, I come next to ſpeak of the *Humours* contained within thoſe Coats, which are in number three, that is the *Aqueus* or watery, the *Vitreus* or glaſſey, and the Cryſtalline: of which the laſt for its uſe is the moſt noble, and is placed almoſt in the centre of the Eyes.

The watery Humour.

Of theſe Humours the *Aqueus* or *watery* is outermoſt, being thin and fluxive like Water, from whence it hath its name. It fills up that ſpace that is betwixt the horney or outmoſt Coat and the cryſtalline Humour in the fore-part of the Eye. It is obſerved in Men, that if any clotted and coloured bits or motes ſwim in this Humour, the ſhapes of ſeveral Inſects, as Gnats, Flies, Spiders and the like, will ſeem to be flying before their Eyes, as hath been oft declared by Men who have had this Affection. I am therefore apt to believe that many Horſes are not without ſuch kind of congealed bits floating in this Humour, that without any evident or external cauſe to occaſion it, are much given to ſtart, eſpecially with their Head; the repreſentation of the aforeſaid Inſects moving before the cryſtalline Humour, which makes them fear ſomething or other is ſtill flying into their Eye.

Yea it is in Humane Bodies farther obſerved, that oft times ſeveral of theſe coloured Particles in the watery Humour do gather together, and unite ſo cloſe, that they grow as it were into a skin or film, ſpreading before the ſight of the Eye, which cauſes an abſolute blindneſs, and is that Diſeaſe which Phyſicians call a *Cataract*; which Diſeaſe the Animal we are treating of is much ſubject to, though we have not ſo proper a term for it as this is.

The Cryſtalline.

The next Humour is the *Cryſtalline*, which is ſo called from its exceeding bright and ſhining colour, being as tranſparent as Cryſtal; It is it ſelf of no diſtinguiſhable colour, that it might receive the Idea's of all colours.

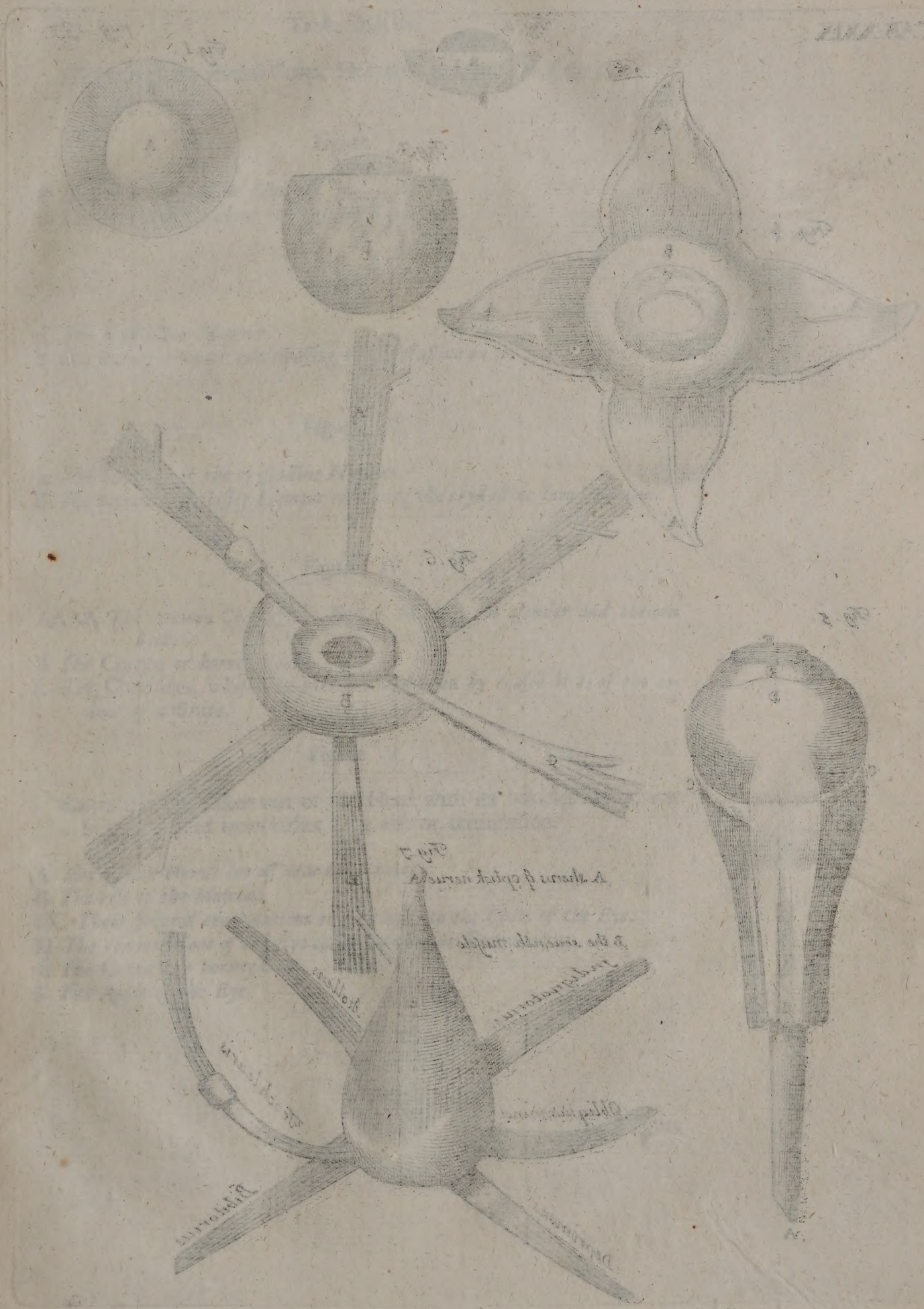
It is placed betwixt the watery and glaſſey Humours, but not exactly in the middle or centre of the Eye, but rather towards its fore-part. It is incloſed in the boſom, as it were, of the glaſſey Humour, and is flattiſh on the fore-ſide, but rounder behind.

This Humour is believed to be the primary or chief inſtrument of the ſight, becauſe it collects or receives the rayes of viſible things; though the *tunica Retina* doth afterwards ſtop them by its dark body, and communicate them to the common Senſory by the Optick Nerve.

The Glaſſey.

The third and laſt of the Humours of the Eye is the *Vitreus* or *glaſſey*, ſo called becauſe in colour it is like to molten glaſs. This is not of ſo thick a conſiſtence as the cryſtalline; but it much exceeds both it and the watery in quantity. It is round in its hinder part but plane before, onely it has a little hollowneſs in the middle wherein the cryſtalline Humour is placed as in a mold or caſe. It fills up all the hinder part of the globe of the Eye, as alſo ſome part of the ſides.

The *uſes* of this Humour are ſaid to be, firſt, to nouriſh the cryſtalline Humour, as *Galen* conceived; next, that the viſible ſpecies received into the cryſtalline Humour might not be reflected, or return defiled by dark and coloured tinctures, whereby the ſight ſhould be diſturbed; but that they might have a free paſſage through it to the *Retina*.

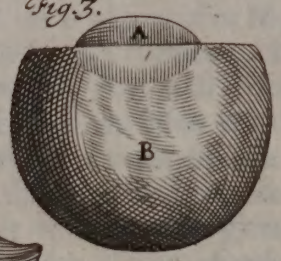


TAB. XXIX.

Fig. 2.

Fig. 1.

Fig. 3.



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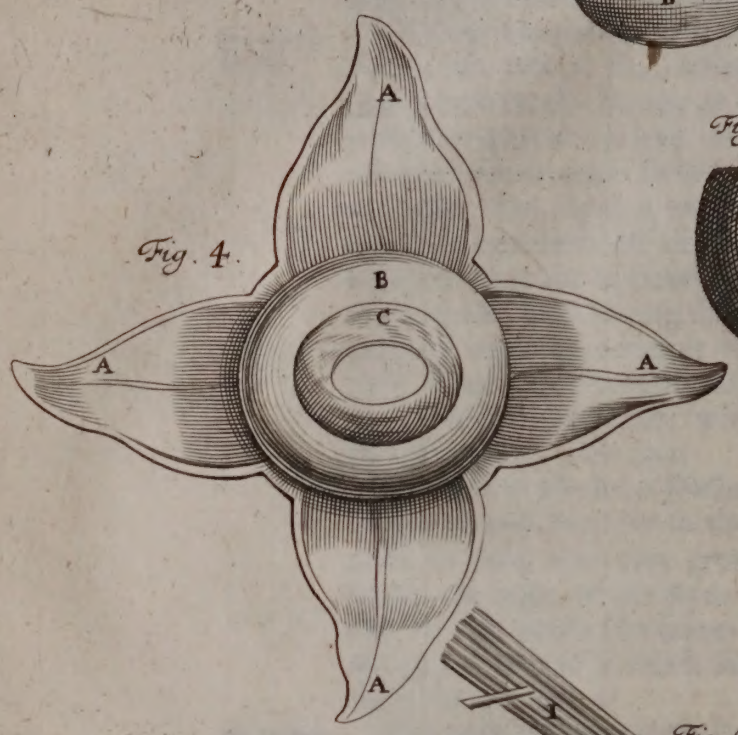

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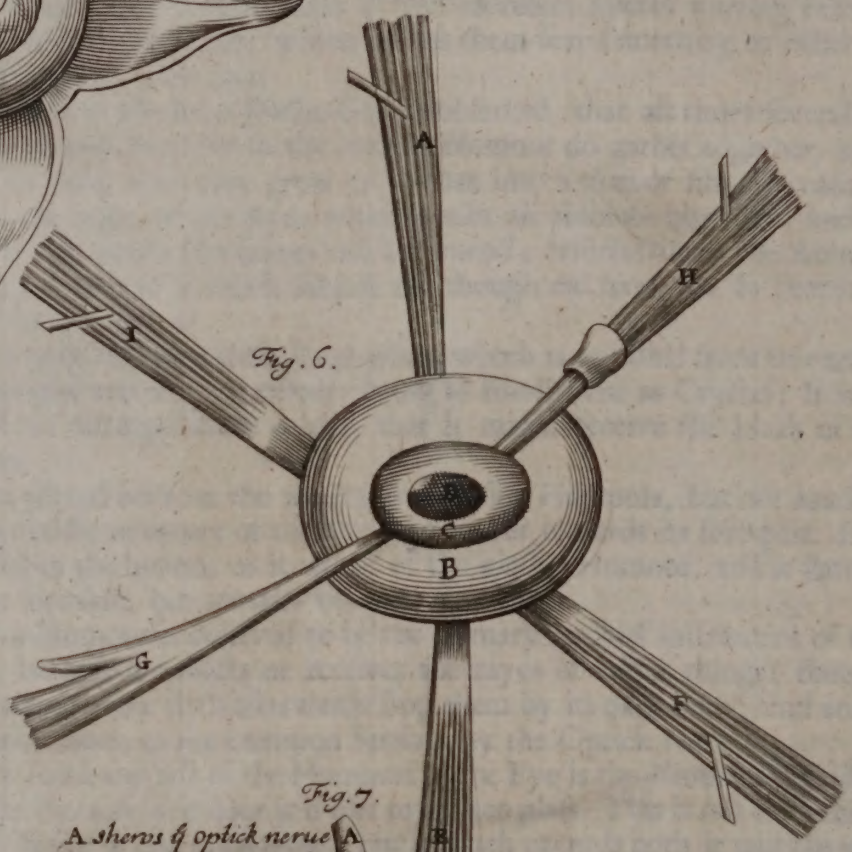


Fig. 5.

Fig. 7.

A shews ỹ optick nerue

B the seuenth muſcle

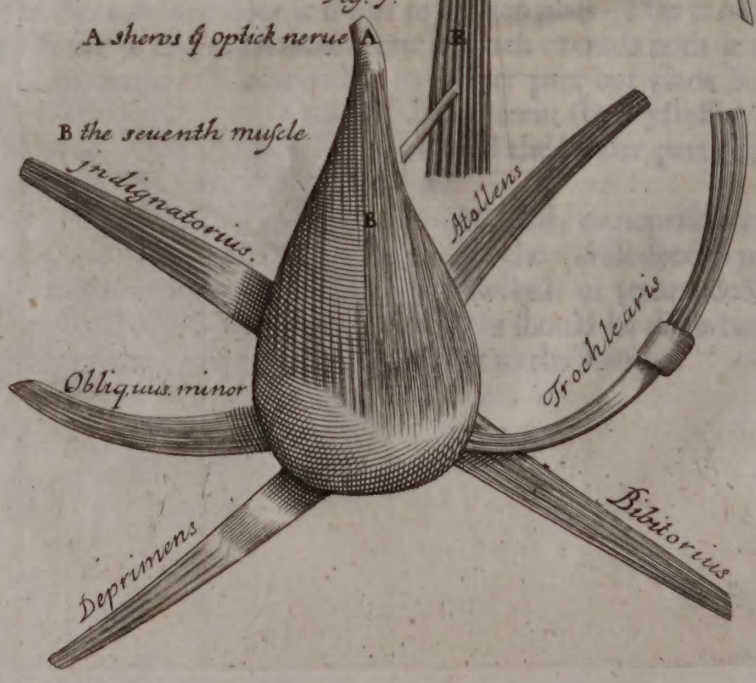


Table XXIX.

Repreſents the ſeveral Coats, Humours and Muſcles of the Eyes.

Figure I.

A *Shews the cryſtalline Humour.*
B *The* Iris *or circle about the ſight of the Eye.*

Figure II.

A *The cryſtalline Humour.*
B *The watery Humour encompaſſing the cryſtalline on its fore-ſide.*

Figure III.

A *The back-ſide of the cryſtalline Humour.*
B *The vitreous or glaſſey Humour receiving the cryſtalline into its boſom.*

Figure IV.

AAAA *The common Coat of the Eye or* Adnata, *cut aſunder and thrown back.*
B *The* Cornea *or horney Coat.*
C *The* Choroides, *whoſe fore-part is called* uvea *by reaſon it is of the colour of a Grape.*

Figure V.

Shews the Eye taken out of the Head with its Muſcles *in ſitu,* not being looſened from either their riſe or termination.

A *The Optick Nerve cut off near the Brain.*
B *The riſe of the Muſcles.*
CC *Their ſeveral terminations or endings into the Coats of the Eye.*
D *The common Coat of the Eye called* Adnata *or* Conjunctiva.
E *The* Cornea *or horney Coat.*
F *The Apple of the Eye.*

Figure

Figure VI.

Shews the fore-part of the Eye with its Muſcles removed from their originals, and placed round the Eye according to the motions they perform.

AAAA *The right Muſcle that lifts up the Eye, called* Attollens.
B *The* Adnata *Tunicle.*
C *The* Tunica cornea *or horney Coat.*
D *The* Pupilla *or Apple of the Eye.*
E *The right Muſcle that draws down the Eye, called* Deprimens.
F *The Muſcle that draweth the Eye from the Noſe towards the outer corner, called* Indignatorius.
G *The Muſcle called* Bibitorius, *which brings the Eye inwards towards the Noſe.*
H *The ſuperiour oblique Muſcle called* Trochlearis, *which carries the Eye ſlantingly to its outward angle.*
I *The inferiour oblique Muſcle, that moves the Eye ſlantingly to its inward angle.*

CHAP. XIV.

Of the Ears and their ſeveral Parts.

THE *Ears* (which according to order we come now to ſpeak to) are the inſtruments of Hearing, framed by Nature with no leſs Art than the Eyes; yea ſo full of intricate Meanders they are, and conſiſt of ſo many Parts, that they will be very hard to be deciphered. Notwithſtanding I will endeavour to give what ſatisfaction I can, by what I have learned by Inſpection, as well as by the Writings of the moſt accurate Anatomiſts.

The Auricle. Firſt then the Parts of the Ear are either *Outward* or *Inward.* The *outward* part is called *Auricula*, which is onely an adjuvant or aſſiſting inſtrument of Hearing, collecting in its hollowneſs ſome part of the Air that is the vehicle of the ſound, as it is paſſing by.

Its Parts. The Parts whereof the outward Ear is framed, are either *proper*, or *common.* The *common* are the Scarf-skin, the true Skin, and *membrana nervea*, or nervous Membrane. The *proper* are the Muſcles, Veins, Arteries, Nerves, and the Griſtle. Of the *Muſcles* we ſhall ſpeak in their proper place, *viz.* in the next Book that treats of the Muſcles. The *Veins* of the Ear are branched to it from the external Jugular Vein; the *Arteries* from the Carotid Arteries; and the Nerves from the ſecond pair of the Neck being joined with the harder Proceſs of the ſeventh pair. As to the *Griſtle* of which for the greateſt part it conſiſts, that is a ſubſtance that is fitteſt for this place; for if it had been bony, the Ear would both have been immoveable,

moveable, and ſo could not have turned it ſelf toward the ſound, as we ſee the Horſe can now move it; and alſo it would have been in continual danger of being broken off: and if it had been fleſhy or membranous onely, the Horſe's Ears would have flap'd down like Hounds Ears, which would have been a great deformity.

The *uſes* of this outward Ear are, firſt, to ſerve for an ornament to the Head; ſecondly to receive, or at leaſt to help to receive the ſounds; for firſt, it gathereth them being diſperſed in the Air; ſecondly, it doth moderate the fierceneſs of their motion, ſo that they come gently to the *Tympanum*, or Drum, and beat moderately againſt it. *Its uſe.*

The internal or inward Ear hath alſo ſundry Parts, contained *in* the *Os petroſum*, as the outward Ear is faſten'd *upon* it. *The inward Ear.*

Theſe Parts are firſt the Drum with its Cord and Muſcles; ſecondly, four little Bones; thirdly, its Cavities with the implanted Air; and laſtly, its Veſſels. *Its Parts.*

The *Drum*, called *Tympanum*, is a nervous, round and tranſparent Membrane, of moſt exquiſite ſenſe, ariſing from the ſofter proceſs of the Auditory Nerve expanded. It is exceeding dry, that it might give the better Echo to the ſound. It is alſo ſtrong, that it ſhould the better endure outward harms or injuries. It hath a *Cord* behind it for ſtrengthning and ſtretching of it, even as the Military Drum hath. As for its *Muſcles*, we ſhall deſcribe them in the next Book. *The Drum.*

Within the Membrane of this *Tympanum* or Drum there is an internal Cavity, called *Concha*, in which are ſeveral little dry Bones, which have in them no Marrow, nor are covered with any Membrane or *perioſteum*: yet at their ends where they are joined together, they are bound with a ſmall Ligament, proceeding from the before mentioned Cord of the Drum. *Four little Bones.*

Theſe little Bones are four in number; the *firſt* of which is called *malleolus*, that is, a little Hammer. This Hammer hath a round head, which by a looſe Ligament is jointed into the Cavity of the ſecond little Bone that is called the Anvil; which head is continued into a ſmall neck, that reacheth beyond the middle of the Drum and adhereth to it. About its middle it hath two Proceſſes, the one of which, being ſhorter, hath the tendon of the internal Muſcle inſerted into it; and the other, being longer, hath the tendon of the external, the Drum intervening. *The Hammer.*

The next of theſe little Bones is by Anatomiſts called *Incus*, the *Anvil*, having one head and two feet, being therefore more like to one of the grinding Double-teeth than to an Anvil. *The Anvil.*

The head of this is indifferent thick, having in the top of it a little ſmooth hollowneſs, which receives the knob or head of the Hammer. The ſmaller foot of the Anvil is tied to the top of the Stirrop by a looſe but firm Ligament, but the thicker foot reſteth upon the *Os ſquamoſum*, or ſcaly Bone.

The third is called the *Stirrop*, having a perforation in the middle, and is fixed before or rather round that paſſage that is called the oval Window, by which ſounds paſs out of the firſt Cavity into the ſecond called the Labyrinth. Which Cavities are wrought by Nature in the Rocky-bone, and contain in them the inbred Air. Now as the cryſtalline Humour of the Eye is the chief inſtrument of the Sight, in reſpect of the reception of viſible Images or Forms; ſo is this inbred Air of the Ear, the chief inſtrument which receiveth the forms of Sounds, although there be another more noble Organ which judgeth of them, as ſhall be ſhewn by and by. *The Stirrop.*

The figure of this Bone is in Horſes triangular, very like the Greek Letter Δ, (but in Men it is repreſented to be of ſomewhat another ſhape) which Letter is like ſuch a Stirrop as we often ſee in old Hangings (not ſuch Stirrops as are uſed now-a-daies) from its ſimilitude unto which I ſuppoſe it hath its name.

The upper part of this Stirrop is ſmall, as you may ſee by the figure of it, upon which the longeſt foot of the Anvil ſtands.

The orbicular Bone. The fourth and laſt of theſe little Bones of the Ear was not long ſince found out by a diligent Anatomiſt, named *Franc. Sylvius*, till whoſe time there were but three Bones of the Ear reckoned.

This Bone from its round ſhape is called *orbiculare*. It is tied by a ſlender Ligament to the ſide of the Stirrop, in that part where the Stirrop is faſtned to the Anvil.

The uſe of theſe Bones. The *uſe* of theſe four Bones is not, that by hitting one againſt another they ſhould produce a ſound, but firſt, to defend the Membrane of the *Tympanum* or Drum, leſt it ſhould be torn and beat inwards by the violent ſhaking of the outward Air againſt it, in loud ſounds, ſuch as Thunder, or the noiſe of great Guns and the like.

Secondly, They are aſſiſting to the Senſe of Hearing on this manner: The external Air beats againſt the Drum, which is driven againſt the Hammer, and this ſtrikes upon the Anvil, as the Anvil bears againſt the Stirrop; which as it does, more ſtrongly or weakly, ſo does the Stirrop open the oval Window more or leſs, and proportionably the ſound appears to the common Senſory, louder, or lower.

The Cavities of the Ear. We come in the next place to ſpeak of the Caverns or *Cavities*, by ſome called Dens, which are formed in the midſt of the *Os petroſum* or Rockey-bone where it bunches out moſt, and are three in number.

Concha. The *firſt* of them is to be ſeen as ſoon as the Membrane of the Drum is taken away, and is called *Concha*, from its reſemblance to the ſhell of a Taber. Others call it the Baſin, and ſome the Den. It has its firſt denomination, (which is that which it is moſt commonly known by) not ſo much from its ſhape, as from its uſe; for when the Membrane is ſtruck upon by any outward ſound, the Echo is made in this Cavity, even as it is in the hollow of a Taber, or in our common Drum when the Parchment is beat upon; for in all theſe the ſound is principally occaſion'd by the Air included in the Cavity.

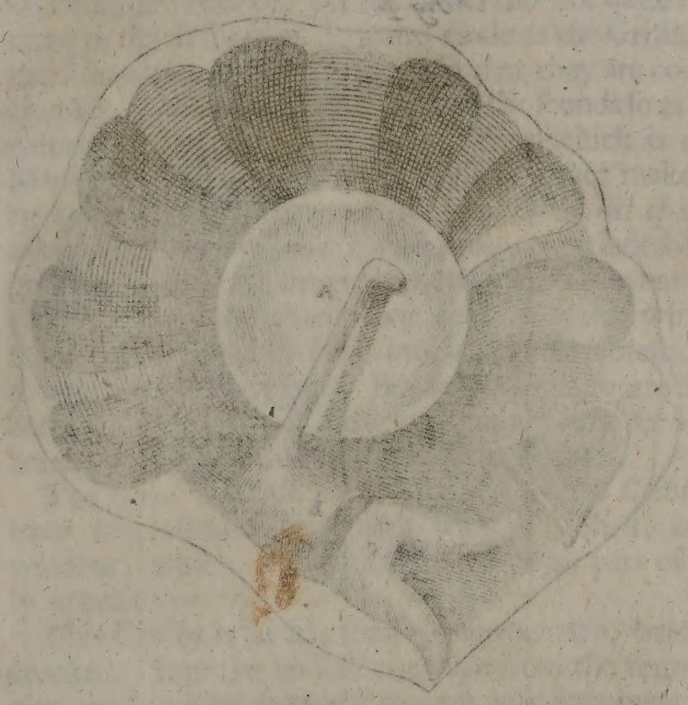
Nature hath placed in this Cavity divers Inſtruments; as firſt, ſome ſerving for pulſation, ſuch are the four Bones, the Cord and the Muſcles, (of all which before.) Secondly, others for conduction into the other Cavities; ſuch are two *perforations* or little holes, commonly called Windows. And laſtly, a third ſort for Expurgation; ſuch are the paſſages which lead, one into the Palate, and another into the Noſtrils, by the help of which the pituitous Matter which is collected in this Cavity is diſcharged.

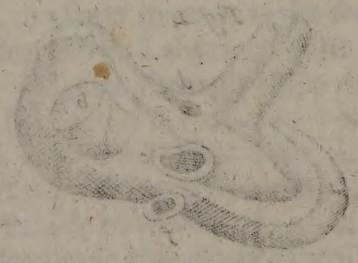
Feneſtra ovalis. The firſt of the *perforations* being the upper and larger, has added to it the Epithet *Oval*, alluding to its figure. This opens inwards or backwards, and that with a pretty wide mouth, into the Labyrinth; but is kept ſhut next the *Concha* by the baſis of the Stirrop, when ſound ceaſes.

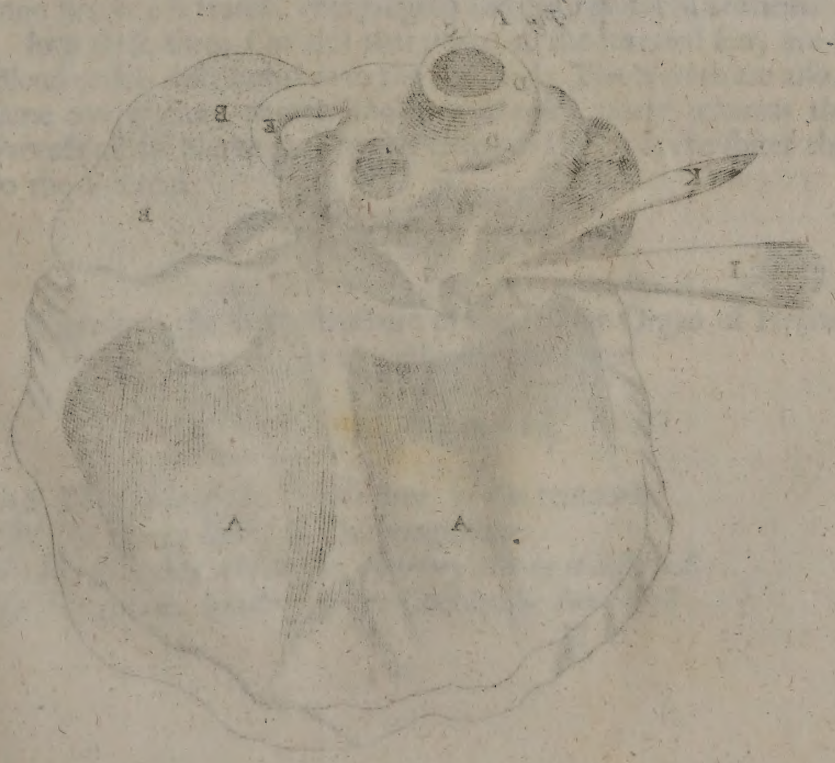
Feneſtra rotunda. The other being the leſs and lower, is of a round ſhape (and therefore ſtyled *Rotunda.*) This is always open having no covering, and is divided by the *Os ſquamoſum* into two Pipes, one of which tends to the *Cochlea*, the other into the Labyrinth.

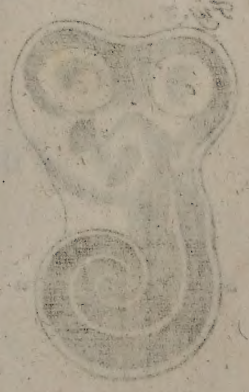
The

TAB. XXX.









TAB. XXX.

Fig. 7.

Fig. 4.

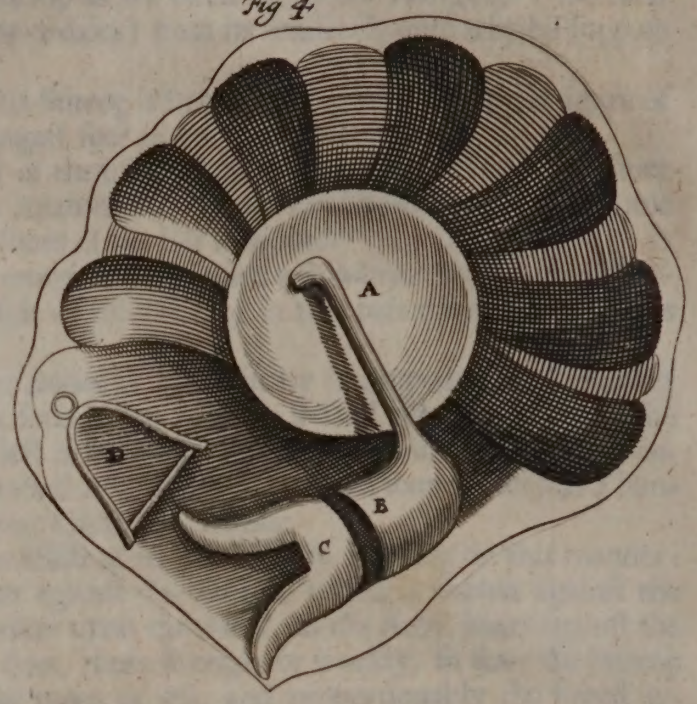


Fig. 6.

Fig. 5.

Fig 2.

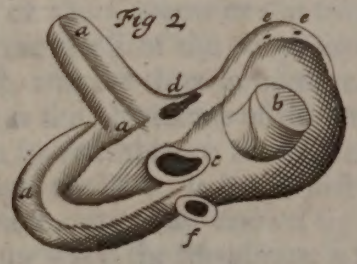


Fig 1.

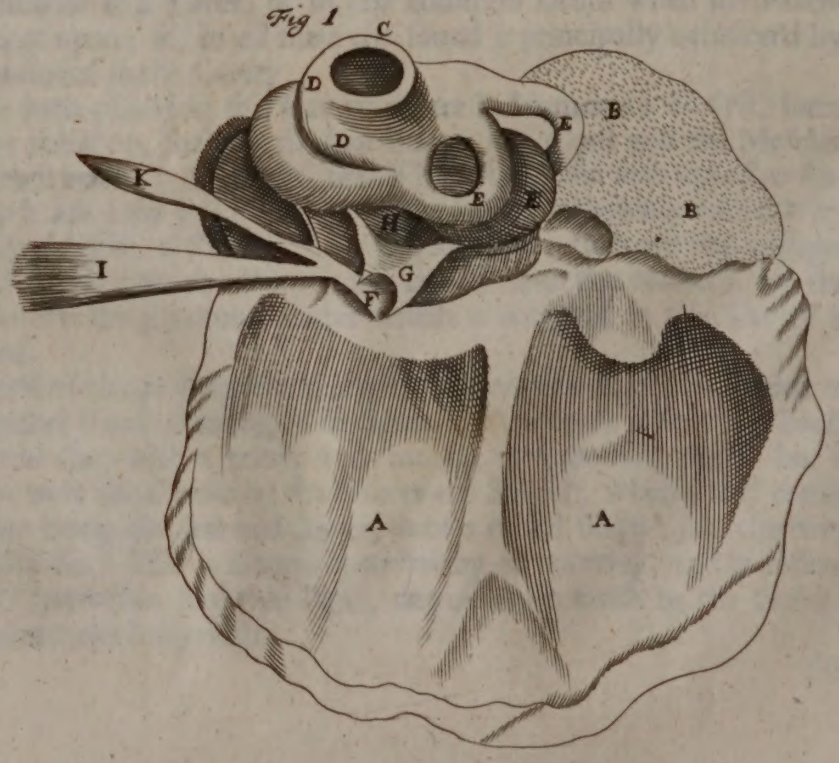


Fig. 3.

The *ſecond* of theſe Cavities of the inward Ear is (from its windings and turnings) called *Labyrinthus*, the Labyrinth. If one conſider it in its whole dimenſion it is round, and much leſs than the former. Its windings are circular, yet the circles run not quite round the Cavity, but come as much ſhort of an intire circle as the Griſtles of the Wind-pipe in the Throat do, or rather more, ſo that they are commonly termed ſemicircular. Their uſe is to modulate the ſounds ſo as they may be leiſurely communicated to the Auditory Nerve which is diſperſed through the Membrane that inveſts this Cavity, or rather makes it. It has three pretty wide holes, two opening *into* it, and one *out of* it. The two that open *into* it, are the oval and round holes, mentioned in the foregoing Paragraph. By theſe the internal agitated Air paſſes out of the *Concha* into the Labyrinth. That which opens *out of* it is that which paſſes towards the third Cavity called *Cochlea*, into which the aforeſaid Air paſſes further by it out of the Labyrinth. Beſides theſe there are four other very ſmall holes for the ingreſs of the nervous Fibres that are inſerted into the Membrane that cloaths this Cavity. *The Labyrinth.*

The *third* and laſt inner Cavity is called *Cochlea* or the Snail-ſhell, from the reſemblance it hath with that Shell, eſpecially in its Spiral winding; which, if you take off the upper part of the Bone, will plainly appear. Cochlea.

This Cavity is far leſs than the former two, being indifferent long but crooked. Into this endeth one Pipe from the round hole of the firſt Cavity, and another from the ſecond, juſt now mentioned.

It is inveſted, as the other Cavities are, with a ſoft and thin Membrane (after the ſame manner as the ſockets of the Teeth are) into which (as into that of the Labyrinth) the ſlender Fibres of the Auditory Nerve do enter, and that through three or four ſeveral holes which are all very ſmall.

It is filled with the internal inbred Air as well as the former, by which the Echo is made to the impulſe of the external Air upon the *Tympanum* that is the vehicle of the ſound: And the Auditory Nerve being inſerted into the Membrane that cloaths the Cavities, is affected therewith, whereby it comes to be communicated to the original of the Nerves where the common Senſory is ſeated, that judgeth and diſtinguiſheth of them.

Into theſe three Cavities that make up the Internal Ear, are the ſame Bloud-veſſels diſtributed as to the External: The Nerves are alſo from the ſame conjugation, namely the ſeventh pair; onely whereas the harder Proceſs of the Nerve goes to the External Ear, it is the ſofter that comes to the Internal.

Table XXX.

Repreſents the inner ſtructure of the Ear or Organ of Hearing, with the Auditory Bones as well leſſer as bigger.

Figure I.

AA *The inſide of the Temple-bone, or* Os temporis.
BB *The ſpongy Bone, or* Os ſpongioſum.
C *The hole into which the Auditory Nerve is inſerted.*
D *The greater winding of the* Cochlea *or Snail-ſhell.*

E *The three bony half-circles that form the Labyrinth.*
F *The* Malleus *or Hammer in its ſituation.*
G *The* Incus *or Anvil.*
H *The* Stapes *or Stirrop.*
I *The External Muſcle of the Ear.*
K *The Internal Muſcle.*

Figure II.

aaa *Shew the Labyrinth.*
b *The* Cochlea *or Snail-ſhell.*
c *The oval hole before which the Stirrop is ſeated.*
d *The Aqueduct found out by* Fallopius.
ee *Little holes to let out the Veins and Arteries.*
f *The* Feneſtra rotunda, *or round Window.*

Figure III.

Shews the *Cochlea* and Labyrinth diſſected.

aa *The intermediate ſpace dividing the* Cochlea *into two wreaths.*
b *The round hole that makes the paſſage out of the* Concha, *into the lower wreath of the* Cochlea.
c *The windings or circumvolutions of the Labyrinth opened.*
d *The* Feneſtra ovalis, *or oval Window.*

Figure IV.

Shews the *Os petroſum* cut through the middle, the plainer to ſhew the round circle over which the Drum is placed.

A *The round circle covered with the* Tympanum *or Drum.*
B *The* Malleus *or Hammer in its natural ſituation.*
C *The* Incus *or Anvil in the like.*
D *The* Stapes *or Stirrop alſo* in ſitu.

Figure V.

Shews the *Incus* or Anvil taken out and freed from the Hammer.

Figure VI.

Is the Hammer taken out alſo and freed from the other Parts.

Figure VII.

Is the Stirrop out of its placē.

CHAP.

CHAP. XV.

Of the Noſe, Lips and Mouth.

HAVING deſcribed all the Organs of *Seeing* and *Hearing*, we come in the next place to the third outward Senſe which is the *Smelling*, of which the Noſe being the Inſtrument, we are now to enter upon its deſcription.

As therefore the Ear is divided into an External or outward, and an Internal or inward part; ſo will we divide the Noſe, it being made of the like parts.

The external Parts of the Noſe. The *External* Parts are the Skin, the Muſcles and Griſtles, Veſſels of all ſorts, as alſo many Bones, and thoſe diſtinguiſhed or divided by ſeveral Sutures.

The Skin. The *Skin* wherewith the Noſe is covered is thin, and without any fat under it, for beauty ſake; for if there had been any fat naturally in this place, it might have been collected to that quantity or bulk, as to have become a great deformity to the Creature: for which reaſon Nature hath ſo ordered it, that in this place the Skin ſticketh ſo faſt to the Muſcles and Griſtles, that it is not eaſie to part it from them without renting.

Bones and Griſtles. The *Bones* which make the Cavities of the Noſe are ſome proper, and ſome common: of which hereafter in the Fifth Book *of the Bones*. The *Griſtles* are five in number, of which we ſhall alſo diſcourſe in the ſame Book.

Veſſels. The *Veſſels* of the Noſe are, *Veins* from the Jugular Veins, and *Arteries* from the *Carotides*; alſo *Nerves* from the third pair of the Brain, which ſend to each ſide of the Noſe one branch, (beſides the olfactory Nerves or firſt pair, called the Mammillary Proceſſes.)

The internal Parts. As to the *Internal* Parts of the Noſe, we ſhall begin firſt with the *Coat* or Skin which compaſſeth the whole capacity of the Noſtrils. This Coat is ſaid to ariſe from that Skin of the Brain which is called the *dura mater*; and is not peculiar to this Part alone, but is as well common to the Mouth, Palate, Tongue, Larynx, *&c.* as to the Noſtrils; onely in the Noſtrils it is thinner and of exquiſite ſenſe; for any thing blown up the Noſe that is of a biting nature, ſo irritates it, as immediately to cauſe the Horſe to ſneeze. This Skin hath on its back-ſide abundance of little Glands or Kernels, in which the Rheum is ſeparated that runs out by the Noſe.

The nervous Membrane.

The muſcular Membrane. There is alſo another Skin belonging to the inſide of the Noſe called the *muſcular Membrane*, which is ſaid to draw together or contract the Noſtrils.

Spongy Fleſh. In the upper part of the Noſtrils there is a red *fleſhy ſpongious ſubſtance*, with which the ſpongy Bones are filled up.

Sieve-like Bone. There are alſo ſeated at the upper end of the Noſe next to the Brain over both Noſtrils a Bone which from its likeneſs to a Sieve, (by reaſon of the innumerable little perforations or holes that are in it) is called *Os cribriforme* or Sieve-like Bone. In the inſide of this Bone are ſeated thoſe two productions of the Brain called *proceſſus mammillares*, which are the true

true Inſtruments of Smelling, and are therefore better called the Smelling-nerves. There paſs from them through the holes of this Sieve-like Bone many little Strings or Fibres, which are diſperſed into all the inward capacity of the Noſe, ſerving there to be the immediate Organs of Smelling, but the Scents are communicated to the common Senſory of the Brain by the aforeſaid Mammillary Proceſſes.

The uſes of the Noſe. The principal *uſe* of the Noſe is for Smelling, which is performed in this manner. The Noſtrils are adjuvant Inſtruments of Smelling even as the External Ear is of Hearing. For as the Ear gathereth the ſounds that fly in the Air; ſo when ſmells exhale out of odoriferous Bodies into the Air, the Horſe by taking in his breath at his Noſe, (which he for the moſt part does, and not in at his Mouth as we often do) the ſcents accompanying the Air aſcend up the Noſtrils to the top of their Cavity, and ſo to the before-named Sieve-like Bone, where affecting the little Fibres of the Olfactory Nerves that come, as hath been ſaid, from the Mammillary Proceſſes through thoſe little holes, thoſe Fibres communicate their ſenſation to the Proceſſes, and theſe convey it to the original of the Nerves or common Senſory, by which it is diſtinguiſhed.

Inferiour uſes of the Noſe are, firſt, to take in the breath by; and next, to ſerve as a common Shore or Sink for the diſcharge and evacuation of the ſuperfluous flegmatick Humours of the Bloud.

The Lips. Their ſubſtance. In the next place we come to treat of the *Lips* (or the external Parts of the Mouth) which are two in number, one upper and the other lower. Theſe are framed of a ſoft fleſhy fungous ſubſtance, as alſo of ſome proper Muſcles covered with the hairy Skin on the outſide of them, but on the inſide they are covered with a Membrane common to the Mouth and Stomach.

Their uſe. The *uſes* of the Lips are firſt to gather the Hay or Oats or other Food into the Mouth; ſecondly to retain, or help to retain it, while it is chewing; thirdly, they ſerve to keep the Gums and Teeth from external Injuries.

The Mouth. Within the Lips is the *Mouth*, whoſe Parts are either *containing* or *contained*, that is, either thoſe that make the Mouth, or ſuch as are contained in it.

The Parts containing. The Parts whereof the Mouth is made, are of two ſorts, ſome fleſhy, others bony. The *fleſhy* Parts are the Lips, of which we have already ſpoken; alſo the Muſcles of the Cheeks and lower Jaw. The *bony* are the upper and nether Jaws, with the Teeth fixed in them.

All theſe Parts (as alſo the whole inward capacity of the Mouth) except the Teeth, are lined with a thick Membrane or Skin, which in the Palate is rugged and knotty as it were, by reaſon of the many little Glands on the back-ſide of it, by which part of the Slaver is ſeparated into the Mouth; and this Membrane reduplicated maketh the *Uvula*, as ſome think; though others more probably hold, that it is of a peculiar ſubſtance.

The Parts contained. The Parts *contained* within the Mouth are divers. As firſt the Teeth and the Bone *Hyoides* at the root of the Tongue; of both which we ſhall treat in the Book of the Bones.

Beſides theſe there are the Gums, the Palate, the *Uvula*, the Almonds, the Tongue, and the Muſcles that ſerve to move it.

The Gums. The *Gums* being in number two, are made up of a hard fleſhy ſubſtance, deſtitute of motion, that ſo the Teeth might be better faſtned in their Sockets.

The

The *Palate* is the upper part of the Mouth, and is called by that name, from its being as it were fenced or *paled* in with Teeth. It extends from the back-part of the Mouth to the Fore-teeth, but is not ſo much hollowed in an Horſe as in Humane Skulls. It hath in it ſome eighteen ſteps or bars which reach from the inſide of the Fore-teeth to the very farther end of the Mouth. It conſiſts of Bones, of a peculiar glandulous Fleſh, and a thick Coat; which Coat is full of little perforations or holes for the Slaver that is ſeparated in the little Glands (above-mentioned) to diſtill through into the Mouth. *The Palate.*

The *Uvula* is a red, fungous and longiſh kind of a Kernel ſeated in the inward or backer-part of the Palate, where the Noſtrils open into the Mouth, hanging directly downward with a ſmall but bluntiſh end juſt over the chink of the *Larynx*. *The* Uvula.

The *uſe* of this *Uvula* is ſaid to be, firſt, to moderate the coldneſs of the Air drawn in by the Lungs. This is *Bartholin*'s opinion, who ſays further, that from this uſe of it it comes to paſs, that ſuch Perſons as want it, die Phthiſical. Whether that be ſo or no I cannot tell: but the main uſe of it in an Horſe I take to be, ſecondly, to hinder the Water, when he drinks, from paſſing out of his Mouth into his Noſtrils. *Its uſe.*

This Kernel is very neceſſary to be known by all profeſſed Farriers, for ſuch knowledge might have contributed to the preſervation of many Horſes which for want of it have been loſt. Such are thoſe which by reaſon of Humours too much flowing to this Kernel have had it ſo much diſtended, that it hath hung down into the Throat to that degree, that the Horſe hath not been able to ſwallow, there being no paſſage left for the Meat to go down; but when he has chew'd it and endeavours to ſwallow it, inſtead of its going down the Gullet into his Stomach, it comes out at his Noſe; whereby it comes to paſs that although the Horſe have never ſo good a Stomach, yet for all that he comes to ſtarve to death with hunger. *The falling of it a Diſtemper incident to Horſes as well as Men.*

This my ſelf have been ſometimes an Eye-witneſs of, and have oftener heard of it by others; but could never ſee nor hear of any of them, that had any help for this Diſtemper; their endeavours proving ſtill unſucceſsfull by their not well underſtanding either the Diſtemper, or the Part affected.

This ſwelling of the *Uvula* in Men is called by Phyſicians *Caſus Uvulæ*; and by the Vulgar, the falling down of the Palate of the Mouth. It is aDiſtemper that commonly comes upon taking ſome great cold; but is very ordinarily cured not by Phyſicians onely, but by every old Woman, who knows that by holding Pepper or Ginger or the like againſt it, the Rheum is thereby drained out of it, and it contracts it ſelf to its due and natural bulk, whereby the Party is ſpeedily relieved. How far ſuch Medicines might contribute to the cure in Horſes, I ſhall forbear in this place to give my opinion, becauſe as I have already ſaid, I do by God's aſſiſtance deſign to publiſh a Book of Cures by it ſelf, but was willing in the firſt place to teach my Practitioner the frame and uſe of the Parts, and to hint ſome of thoſe Diſeaſes they are incident to, which we have leaſt underſtood: and by that time the Ingenious Student is come to underſtand them, I ſhall I hope be ready to publiſh a new and certainer way of curing them than has hitherto been practiſed.

Next we come to ſpeak of the *Tongue* and its Parts. It is called in Latin, *Lingua, à lingendo*, from Licking. It is in figure long, broad and thick, *The Tongue.*

Its Membranes. thick, eſpecially towards the root. It is covered with two Skins; the *outward*, cloathing onely its upper part, which in an Horſe is almoſt as ſmooth as in Men, though it is much rougher in Oxen, and the like. This Membrane is very porous.

The *inward* Skin covers the whole Tongue, the lower ſide as well as the upper, and is thin and ſoft, having many Teat-like Protuberances bunching out of it, which are inſerted into the pores or holes of the outward Coat.

Its ſubſtance. Concerning the *ſubſtance* of the Tongue there is diverſity of opinions; for ſome would have it of a glandulous, others a muſculous ſubſtance; and ſome, that it has a peculiar ſubſtance: to which opinion I moſt incline, becauſe I do not find in any Part of the Body a ſubſtance like it.

Its Veſſels. It hath *Veſſels* of all ſorts; *Veins* from an inward branch of the external Jugular; *Arteries* from the Carotid Arteries; and *Nerves* of two kinds, one from the fifth and another from the eighth pair of the Brain.

The Tongue hath at its root ſeveral *Muſcles*, by which all its motions are performed, of which we will ſpeak in the next Book. And beſides the Muſcles, there is alſo at the root of the Tongue a conſiderable quantity of Fat, with which the Muſcles are interlarded as it were.

Its uſes. The *uſes* of the Tongue are, firſt, to taſte the Food that is offered, whereby (as well as by the ſmell) the Horſe diſtinguiſheth whether it be good and wholſom for him or not; and in the next place it helpeth the chewing of the Meat, by toſſing it to and fro, and after it is chewed, it aſſiſteth in turning it down to the Stomach.

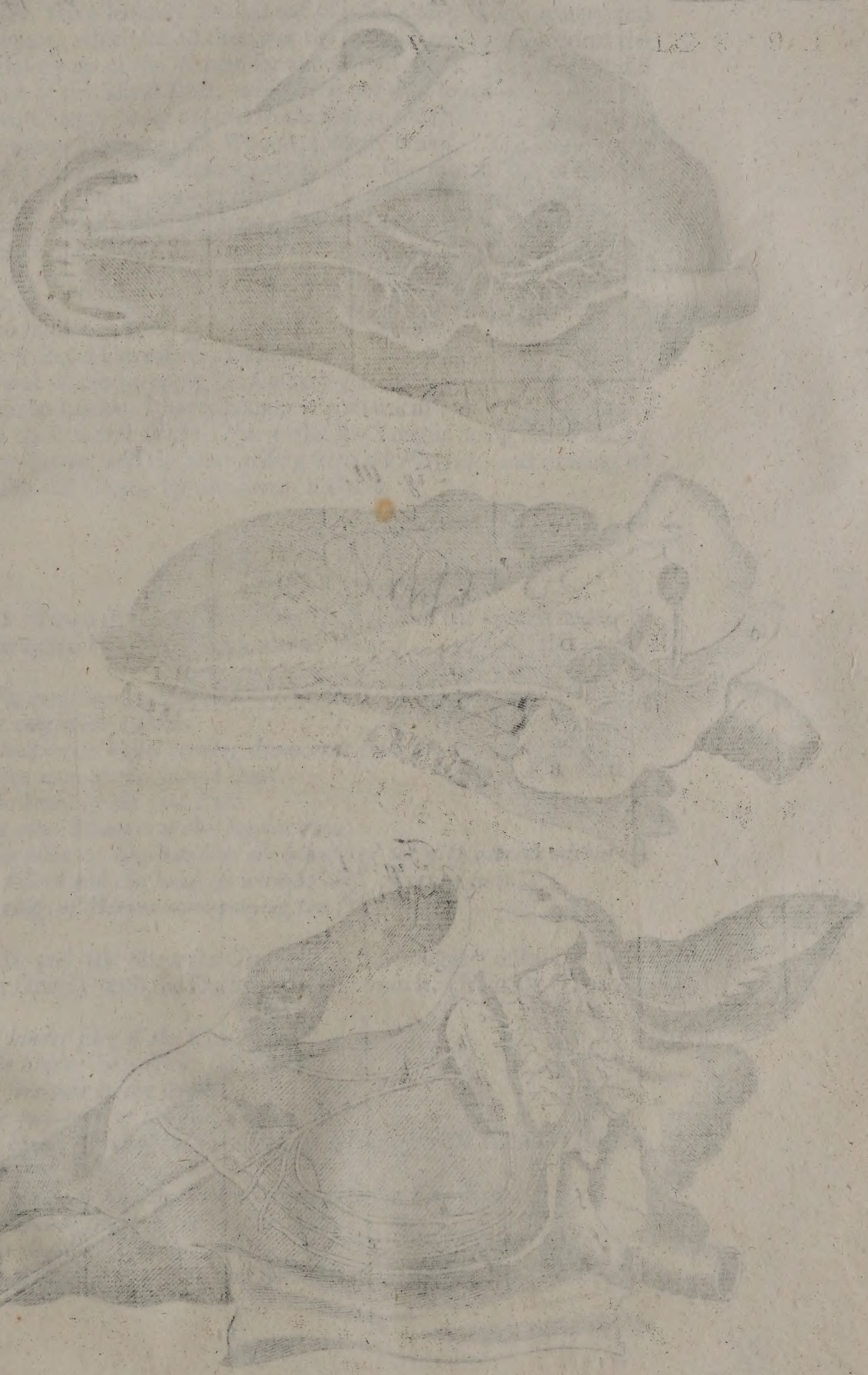
The ſalival Ducts. There is to be found out by diſſection underneath the root of the Tongue a large Kernel, from whence two Pipes, called ſalival Ducts, do ſpring, one from the fore, and the other from the hinder part of it: Theſe two at a ſmall diſtance from the Gland unite into one, which runs pretty ſtreight forward under the Tongue toward the Chin: but in the middle way, as Doctor *Wharton* affirms, there are other pretty remarkable Glands (in an Horſe) that ſtand on each ſide this Duct, and diſcharge themſelves into it. When it is come near the Chin at the Bridle of the Tongue, it ends into other ſmall Glands, through which it pours into the Mouth part of the Slaver that keeps it continually moiſt.

Beſides this Duct there are two others of the ſame uſe, which do ariſe out of the Kernels below the root of the Ear, (called *Parotides*) and run on the outſide of the Jaw-bone to the middle of that Muſcle of the Cheek that is called *Buccinator*, where they open into the Cavity of the Mouth, into which they diſcharge the before-named Liquor, which in theſe and the other Glands of the Mouth is ſeparated from the Bloud.

The uſe of the Slaver. Now we muſt underſtand, this Slaver (or *Saliva*) is not merely an Humour excrementitious, as that is which is ſeparated in ſeveral Kernels in other Parts of the Body, as particularly in the Guts; for this is of great uſe, not onely in that it continually moiſtens the Mouth, as alſo the Hay and Oats whilſt they are in chewing; but being ſwallow'd down with the Meats, it doth further the fermentation and concoction of them in the Stomach, whither part of this Juice alſo goes with every morſel. It is of the ſame nature with that which in Men we call the Spittle, and of the ſame uſe.

And here it may not be amiſs to recite a ſtory I have read of a Perſon that had one of theſe external ſalival Ducts wounded, becauſe I have obſerved (the laſt Spring at *Greenwich*) the ſame accident happen to an Horſe, with the ſame ſymptom. The Story is thus: A Noble-man being

wounded



TAB XXXI

Fig. II.

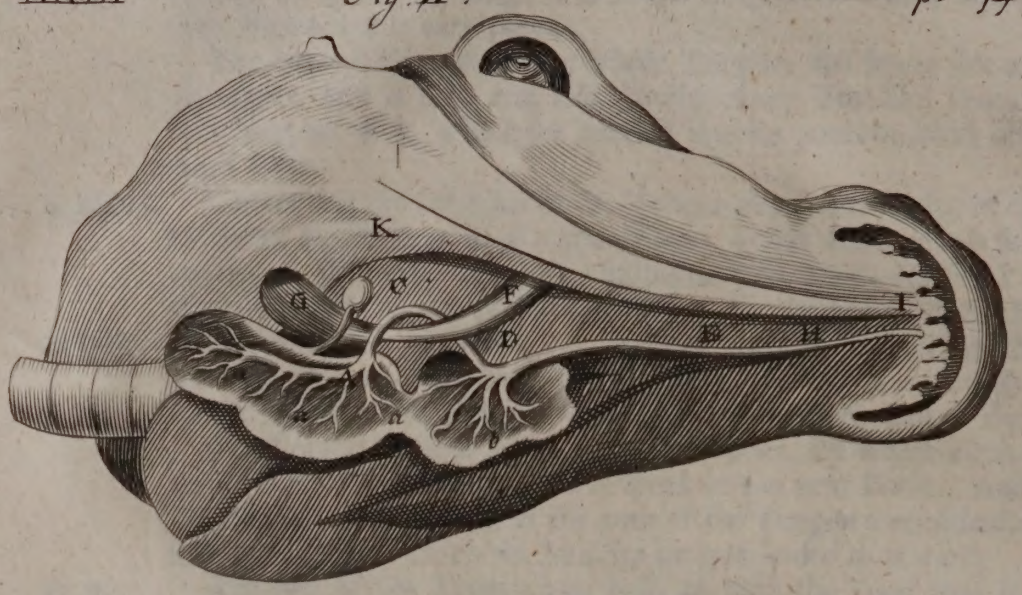


Fig. III.

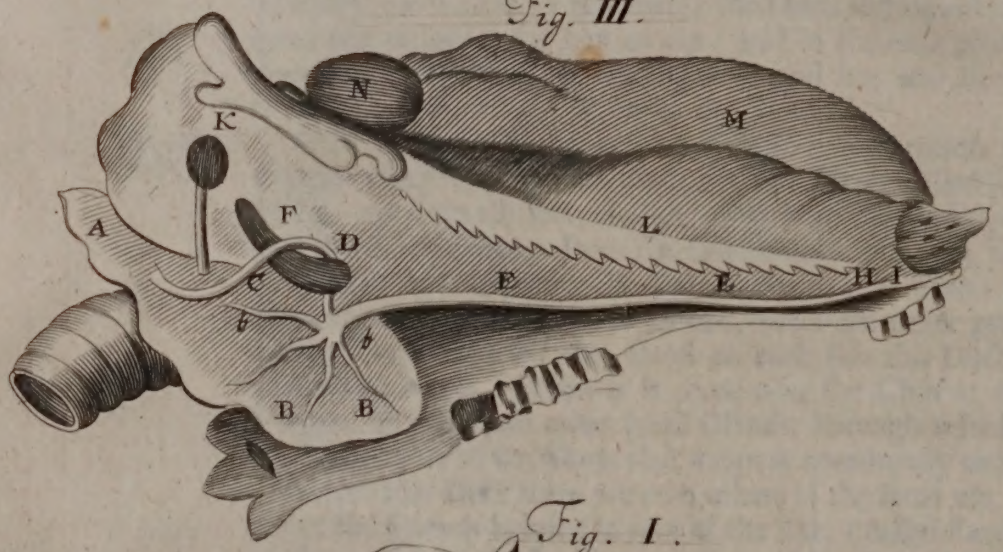


Fig. I.

wounded in the middle of the Cheek with having a Glaſs thrown at him; the Wound was quickly *almoſt* cloſed, but in the middle of it, through a little hole, there leiſurely diſtilled out of it for a long time a watery and clear Liquor, which for all that ever the Surgeon could doe, hindred the intire cloſing up of the Wound for almoſt two years. This Liquor did diſtill out of the ſalival Duct, which was not then found out; but at laſt an actual Cautery being applied to the end of the Duct, the Liquor was by that means ſtopt, and the Wound preſently healed. The Horſe that I ſaw had a clear watery Humour running in like manner out of the ſide of his Cheek, but in that quantity, that in a few hours time (eſpecially in the time next after his drinking) it would make his Manger all a float. A Farrier had him under cure there, and my opinion being ask'd, I adviſ'd to ſear it, but he that had him in hand not knowing the occaſion of this flux of Humour, thought rowelling of him would ſerve; but what he did to him, I had no opportunity ſince to inform my ſelf.

Now ſeeing a like caſe to this may happen, that my Practitioner may underſtand where to apply his Cautery (or red-hot Iron) for the ſtanching of the Liquor, I have thought it convenient to annex a Scheme of each of theſe ſalival Ducts; *that* under the Tongue being found out by Doctor *Wharton*, and the *other* ariſing from the *Parotides* and running on the outſide the Gums, by one *Steno*, a Dane.

Table XXXI.

Fig. I. Shews the ſalival Duct that ſprings from the Glands under the Ear called *Parotides*, (in a Calves Head.)

aaaa *The conglomerate* Parotis.
bb *The conglobate* Parotis.
c *The lymphatick Veſſel tending downwards from the conglobate Gland.*
dddd *The roots of the ſalival Duct.*
eee *The Trunk of the ſaid Duct.*
ffff *The outer branches of the Jugular Vein.*
ggg *The Nerves, which as they are inoculated one with another within the Gland and the head, ſo without theſe places as in* h.
ii *The twigs of Nerves accompanying the ſalival Duct.*

Fig. II. and III. Shew the Gland under the Tongue (called the maxillar Gland) with the Duct that ſprings from it, (from Dr. *Wharton.*)

A *The hinder part of the Gland.*
aaa *The hinder roots of the ſalival Duct.*
B *The fore-part of the Gland.*
bb *The fore-roots of the ſaid Duct.*
C *The hinder Trunk of the ſame Duct, climbing upon the Tendon of the double-belly'd Muſcle.*
D *The return of the ſame and its union with the Fore-duct.*
E *The common Trunk of the ſalival Duct.*
FG *The double-belly'd Muſcle.*
H *The progreſs of the ſaid Trunk towards the Fore-teeth of the lower Jaw.*

I *The opening of the ſalival Duct under the tip of the Tongue near the Fore-teeth of the ſaid Jaw.*
K *The round Gland that lies by the Maxillar.*
L *A row or rank of aſperities (or roughneſſes) under the ſide of the Tongue.*
M *The Tongue thruſt to one ſide out of its place, that the exit of the Veſſel may be ſeen.*
N *The Tonſil or Almond of the Ear.*

Having now gone through the firſt diviſion of the Body, which is into three Venters or Regions, wherein I have principally treated of the Parts contained in them; it now remains that I examine the Parts wherewith the Venters themſelves are made up, laying each apart by themſelves, that their natures, differences and figures may better appear. The Parts of this nature are the Fleſh and Bones, of which two it will be moſt proper to begin with the Fleſh, both becauſe it maketh the greateſt part of the bulk of the Body, and alſo becauſe of its quick tendency towards putrefaction, whereas the Bones are of a durable nature, and ſo no inconvenience will happen upon deferring the examination of them to the laſt.

The End of the Third Book.

THE

THE ANATOMY OF AN HORSE.

BOOK IV.

Of the Muſcles.

CHAP. I.

Containeth a deſcription of the ſeveral ſorts of Fleſh, and an Apology for not expreſſing the Muſcles ſo particularly in Figures as I have done other Parts of the Body.

IN the Firſt Book Chap. 6. treating of the Muſcles of the Belly, I affirmed that all the *fleſhy* Parts of the Body are *muſcular*; which muſt be underſtood not of all *Fleſh* in *general*, but onely of Fleſh *properly* ſo called. For there are four kinds of Fleſh: Firſt, that which is properly ſo called, ſuch as is that of the *Muſcles*; ſecondly, that of the Bowels, as of the Liver and Spleen, and the like; thirdly, that of the Glands or Kernels; and fourthly, membranous Fleſh, ſuch as is that of the Stomach, Guts, *&c.*

The Fleſh of the *Muſcles* is ſoft and ruddy, conſiſting of Fibres and coagulated or curdled Bloud, called a *Parenchyma.* For the Bloud in its circulation as it paſſeth out of the Arteries into the Veins, is extravaſated out of the Arteries into the very fleſhy ſubſtance, out of which it is not

ſo clearly imbibed or drunk up by the Veins, but that ſome particles of it adhere to the fleſhy Fibres, and fill up their interſtices, that is, the empty ſpaces between one and another: which Bloud congealing and fixing there, does, I ſay, together with the Fibres conſtitute that ſubſtance which we properly call Fleſh.

As to the other Parts that ſerve to conſtitute a Muſcle, as alſo of its uſe, and the reaſon of their ſundry denominations, I diſcourſed ſo fully in the above-mentioned ſixth Chapter of the Firſt Book, that I ſhall not need to add any thing to the ſame purpoſe here: onely I think my ſelf in this place obliged to give the Reader the reaſons, why I have not repreſented the Muſcles in Figures particularly, as I have done other Parts of the Body, nor dare be ſo confident of my exactneſs in the deſcription of them; for

Firſt, The Muſcles are ſo numerous, that to have expreſt them all in Figures would have made this Volume at leaſt half as dear again as it is; as may be gueſt by the number of Copper-plates (in Folio) that Mr. *Brown* has repreſented the Muſcles of an Humane Body upon; for they are near fourty, and theſe of an Horſe muſt have required rather more than fewer.

Secondly, Though ſome knowledge of the Muſcles, eſpecially the external ones, is neceſſary that one may know in Tumours which way to make inciſion (that is, lengthways of the Muſcle and not acroſs, for fear of rendring it uſeleſs by cutting its nervous Fibres aſunder) yet to be ſo very exact in the knowledg of all of them, is matter rather of commendable curioſity than real uſefulneſs.

But thirdly, The chief reaſon is (for I will confeſs it) that I have not had the opportunity my ſelf to raiſe and inſpect every particular Muſcle, ſo that I muſt have delineated ſeveral of them by gueſs and upon truſt, whereby I ſhould both have betrayed my own importune vanity, and have led my Reader 'tis like into ſeveral Errours. Neither probably may my verbal deſcription of them be *truly exact* as to thoſe which I have not my ſelf viewed: though ſeeing in thoſe that I *have* inſpected, I have found ſo great a ſimilitude between the Muſcles of an Horſe and thoſe of a Man, I hope I ſhall not be much wide of the truth, if I preſume of the ſame Analogy or likeneſs in thoſe that I have *not* inſpected.

Now as to the likeneſs of a Man's and an Horſe's Muſcles the Reader may be pretty well ſatisfied if he compare thoſe of an Horſe's Belly (delineated with the autopſie or ſelf-view of the Graver) expreſt at the end of the ſixth Chapter of the Firſt Book, with thoſe of a Man's: or take but a proſpect of the next following Figure which repreſents an Horſe, ſeveral of whoſe Muſcles I have preſerved, and after having raiſed them, placed them in their ſeveral places again, the Horſe ſtanding up in a Preſs with them on, juſt in the ſame poſture as he appears in the Figure.

To theſe reaſons I might add the impoſſibility that moſt of my Profeſſion ſhould ever attain to an exact knowledge of them; ſo that this Book being principally deſigned for their uſe, I ſhould have been at a great deal of coſt and more pains to no great purpoſe. Now the difficulty lies in this, That moſt of the names of the Muſcles being originally Greek, and ſeveral of them ſuch as can no way aptly or intelligibly be rendred into Engliſh; and conſidering the mean education of moſt Farriers, that few of them underſtand ſo much as Latin; I ſay conſidering theſe things, 'tis impoſſible to deſcribe them to their capacity, and therefore I have contented my

ſelf with a more ſuperficial and ſuccinct deſcription of them. And though for my own part I may without vain-glory pretend to a more liberal education than moſt of my Profeſſion, ſo that the Cramp-names (as we call them) of the Muſcles are no ſuch hindrance nor diſcouragement to me as they will be I fear to moſt others; yet I hope no curious and ingenious Anatomiſt, that knows how much time and pains is neceſſary to be ſpent upon the exact examination of any one Part, will think me ſluggiſh and ſupine, that I have not in thoſe few years that I have applied my ſelf to this ſtudy, attained as yet to the full knowledge of all the Parts of this Beaſt that I anatomize. And as on the one hand I hope I may my ſelf attain to greater skill in this Art than I have yet arrived at; ſo on the other hand I would not be guilty of the vanity of thinking to monopolize it, but ſhall both deſire and hope that others will make up what I ſhall leave imperfect. But thus much I hope may ſerve for mine Apology with all ingenuous Men, I ſhall therefore return from whence I have digreſſed.

A ſecond ſort of Fleſh is that of the *Bowels*, as of the Liver, Spleen and Kidneys, whoſe ſubſtance hath been held to be for the greateſt part parenchymous, or to conſiſt of an affuſion of Bloud congealed about the Veſſels; though latter Anatomiſts do affirm them to be for the greateſt part glandulous. And to theſe hath uſed to be reckoned the Heart; but that is of a ſubſtance far different from theſe, as being truly muſcular, and may therefore more properly be ranked with the Muſcles, though it be of a more hard and compact frame than them alſo.

A third kind of Fleſh is that of the *Glands*, ſuch as the *Thymus*, which by ſome is called the Sweet-bread, and is ſituated near the Collar-bone juſt within the Cheſt, of which we have already treated in the Second Book. Of this ſort of glandulous Fleſh likewiſe are the *Parotides* or Kernels below the Ears, alſo the Tonſils (commonly called the Almonds of the Ears) very many Glands in the Meſentery and other Parts of the Body; to which may be added the *Pancreas* ſeated in the Lower Belly, which is commonly known by the name of the Sweet-bread.

Now the Glands being ſpermatical Parts, their parenchyma or fleſhy ſubſtance is not ſanguineous or bloudy, as that of the two former kinds of Fleſh; but ſpermatical, compoſed out of the very firſt rudiments of the embryo or conception. And though the Glands are many times encreaſed in bulk, as particularly in Humane Bodies affected with the King's-Evil, and in Horſes which upon taking great Colds have the Tonſils or Almonds of the Ears, and alſo the *Parotides* or Kernels below the Ears, ſo ſwelled and ſore, that the Horſe will not be able to ſwallow his Drink, or at leaſt not to hold down his Head to take it, but muſt be forced to have it given him in a Pail held up as high as the Manger; yet I ſay, the encreaſe of theſe Kernels happens not upon any extraordinary afflux of Bloud flowing to thoſe Parts, but by a flegmatick Humour falling upon them, and when the Diſtemper is cured they return again to their former ſmallneſs, being according to Nature incapable of that growth that is natural and proper to the Parts called ſanguineous. To this ſort of Fleſh (ſay ſome Authours) may the Brain be reduced.

The laſt ſort of Fleſh is that which is called *Membranous*, ſuch is that of the middle Coat of the Gullet, Stomach, Guts, Womb and Bladder. For though the inmoſt and outermoſt Coats be purely nervous or membranous, yet the middle conſiſts of two ranks of Fibres and a Paren-

chyma

chyma that adheres to them, which is diſcoverable particularly in the Guts, when they are ſcraped by Men that make ſtrings for muſical Inſtruments, for then you may perceive a great deal of ſlimy ſtuff to be ſcraped off them, which is this Parenchyma: For that they loſe no part of their membranous or fibrous ſubſtance is evident, in that their ſtrength is rather increaſed than diminiſhed by ſuch ſcraping. This Coat notwithſtanding it is muſcular, yet its Parenchyma differs in many regards from that of the ſanguineous Muſcles, particularly in that it is ſpermatical as was ſaid before of the Glands.

Now the Parts that conſiſt of theſe three latter ſorts of Fleſh are all deſcribed in their proper places; but thoſe that conſiſt of the firſt ſort, which as I have ſaid, is moſt properly ſo called, I intend to treat of in this Book which containeth the Doctrine of the Muſcles.

CHAP. II.

Of the Muſcles of the Eye-lids.

HAving in the ſixth Chapter of the Firſt Book ſpoken of the ſeveral Parts of which a Muſcle is compounded, and alſo of the differences and actions of them; as likewiſe of what uſe they are in general; (to which Chapter I refer the Reader) My propoſed method requires that I ſhould now come to ſpeak to every particular of them, beginning with thoſe of the Lower Belly: but having in the before-cited Chapter of the Firſt Book treated particularly of *them*, I will in this place paſs them by, deſiring the Reader to conſult the ſaid Chapter for his ſatisfaction; for I love not to be tedious with repetitions.

The Eye-lids have three pair of Muſcles.

The next Muſcles then that we come to ſpeak to according to order, are the Muſcles of the *Eye-lids*, which are in number three to each Eye.

One pair to open them; and

The firſt of theſe is called *Rectus* or *Aperiens*, from its office, which is to lift up or open the Eye-lid.

This is ſeated in the upper part of the orbit of the Eye, and ſpringeth with a ſlender but fleſhy beginning from the ſame place as the *Elevator* of the Eye doth, (which is at the hole which the Optick Nerve paſſes through into the orbit) and holds the ſame courſe with it, being of the ſame figure and ſubſtance, that is, fleſhy; till at laſt parting from it, with a pretty broad but thin Tendon, it is inſerted into the Griſtle at the edge of the upper Eye-lid, where it ſerves (as hath been ſaid) to open the Eye-lid by lifting it up.

Two to ſhut them.

The two other Muſcles of the Eye-lid are called *Shutters*, and otherwiſe *ſemicircular*, becauſe each runs the length of one Eye-lid: though there are ſome that call them *circular* or *orbicular*, ſuppoſing them to be but one Muſcle which compaſſes the Eye-lid round as with a circle. But in Bodies that are very muſculous or fleſhy, they have by curious Anatomiſts been plainly diſcovered to be two, and that the rather, becauſe each receives diſtinct Nerves from different places. They lie betwixt the carnous Membrane and the inner ſmooth Skin that lines the Eye-lids.

That

That which draweth down or ſhutteth the upper Lid is larger, and ariſeth from the inner corner of the Eye, from whence it paſſeth acroſs, though with a kind of an oblique line, towards the outward corner, growing preſently fleſhy and broad, ſo that it filleth up all the ſpace betwixt the Eye-brow and the loweſt edge of the Eye-lid, and ſo at laſt is inſerted into the outward corner of the Eye.

The leſſer of theſe two is that which moveth the lower Lid in order to ſhut it. This is rather membranous than fleſhy at its origin, (being alſo very thin) and takes its riſe at the inner corner of the Eye with a ſharp beginning as the former did: whence being carried overthwart, it proceeds to the middle of the Eye-lid, where it becomes ſomething fleſhy, and continues its courſe to the outward corner, which it turns about, and aſcending a little to the upper Eye-lid, is with an indifferent broad end inſerted into it.

The Fore-head Muſcles.

There is another pair of Muſcles which though not belonging properly to the Eye-lids, yet ſeem to contribute ſomething to their motion upward or opening, which therefore may reaſonably be deſcribed in this place, and thoſe are the *muſculi frontales*, or Fore-head Muſcles. Theſe ariſe from the Skull near the coronal Suture, and deſcend with ſtreight Fibres to the Eye-brows, where they terminate. By the help of theſe Muſcles the Skin of the Fore-head to which they cloſely ſtick is contracted or wrinkled, and ſo by conſequence the upper Eye-lid's a little drawn upward.

CHAP. III.

Of the Muſcles of the Eye.

The Eyes have ſeven pair of Muſcles.

TO the moving of each Eye of an Horſe do belong ſeven Muſcles; though in Humane Bodies there are accounted but ſix, becauſe the circular or ſuſpending Muſcle is ſaid in them to be wanting.

Of theſe ſeven, four are ſtreight, two oblique or ſlanting, and the other circular or round. The ſtreight ſerve to move the Eyes upwards and downwards, to the right hand and to the left. The oblique move them obliquely; and the circular or round one keeps the Eye ſuſpended up in its place.

Their riſe and inſertion.

Theſe Muſcles have all their riſe from one and the ſame place; they have alſo the ſame progreſs and ſtructure, and their termination is alike: for they do all ariſe from the Membrane that inveſts the Orbit of the Eye near the hole where the Optick Nerve paſſeth from the Brain into the ſaid Orbit, touching one another at their beginning; but they immediately ſeparate, and in their courſe become ſtill more and more bulky and fleſhy till their middle, which is round and buncheth out with a kind of a belly; but as they grow toward their ends or terminations they degenerate from their fleſhy into a thin membranous ſubſtance, which is inſerted into the horney Coat of the Eye, encompaſſing it as far as it is white.

Theſe

Whence they have their names. Attollens *and* Deprimens.

Theſe Muſcles have their ſeveral appellations or names from the ſeveral motions they perform; as firſt, The firſt of the *ſtreight* Muſcles, from its office of pulling up the Eye, is called *Attollens*: The ſecond is called *Deprimens*, becauſe it is an Antagoniſt to the former, for as that pulls the Eye up, ſo this by a contrary motion pulls it down again. From which offices they have alſo in Men other two names given them by Anatomiſts: the firſt is called *the proud*, becauſe when the Eye is pulled up, a Perſon looks high and lofty or proud: and on the contrary when the Eye is pulled down by the other Muſcle, he looks with a contrary countenance, ſubmiſſive and humble, for which reaſon this ſecond Muſcle is called *humilis* or *the humble* Muſcle.

Adducens.

The next, being the third ſtreight Muſcle, is called *Adducens*, becauſe it pulleth the Eye towards the Noſe. It is otherwiſe called *Bibitorius*, becauſe it performs that motion of drawing the Eye to the Noſe when we drink, for then we commonly look into the Pot or Glaſs that is before our Noſe.

Abducens.

The fourth ſtreight Muſcle is called *Abducens* or *Indignatorius*, from its office of drawing the Eye to the outer corner, which turn or aſpect of the Eye betokens anger or ſcorn.

Now theſe four Muſcles have theſe four ſeveral motions, when they work ſeverally; but when they all four work together, they have but one action, which is to keep the Eye ſteady and fixt, which Phyſicians call a tonick motion: but in Beaſts that have the ſuſpending Muſcle, the tonick motion is performed mainly, if not altogether, by that Muſcle. You have theſe four, as alſo the three other lively repreſented to you in the twenty fifth Table of the Third Book, *p.* 123.

The upper oblique Muſcle.

The next are the *oblique* Muſcles, being as hath been ſaid, in number two pair, which from their rolling the Eye about are called *circumagentes*. The *firſt* of them is called *obliquus major vel ſuperior* (or the uppermoſt and largeſt oblique Muſcle) being longer than the other, but rather ſlenderer. It ſpringeth from the upper but inner part of the Orbit of the Eye by the hole where the Optick Nerve comes through, (as do all the reſt.) From hence it paſſeth ſtreight to the upper part of the inner corner of the Eye, where it endeth in a ſmall round Tendon, which paſſeth through a tranſverſe Cartilage or Griſtle there placed, called *Trochlea* (or the Pully) and thence continueth its courſe ſlantingly along the upper part of the Eye, till at laſt it is inſerted into the outmoſt Skin of the Eye between the Tendons of the Muſcles *Attollens* and *Abducens*. This rolleth the Eye towards its inner corner.

The lower oblique Muſcle.

The *ſecond oblique* Muſcle is called *obliquus minor ſive inferior*, or the leſs and lower oblique Muſcle, being ſhorter than the other, though rather thicker. This ſpringeth from a chink which is in the lower part of the Orbit of the Eye, beginning with a fleſhy head, from whence it aſcends with a ſlanting courſe towards the outward corner of the Eye, about which it turns, and then ends in a ſhort roundiſh and nervous Tendon, which meets with the Tendon of the other oblique Muſcle, and ſeeming to unite with it, is inſerted in the ſame place. This rolls the Eye towards its outer corner.

The orbicular Muſcle.

The ſeventh Muſcle is called the *orbicular* or *round*; likewiſe *Muſculus ſuſpenſorius*, the ſuſpenſory Muſcle; and laſtly, becauſe it is onely found in Brutes, it hath the name given it of *ſeptimus Brutorum*, the Brute's ſeventh Muſcle. It is ſhort and fleſhy, encompaſſing the Optick Nerve,

and

and is inſerted into the hinder part of the *Cornea*. You have the figure of it in the afore-mentioned twenty fifth Table of the Third Book, wherein it is removed from one Eye, but in the other it is plainly repreſented *in ſitu*. The uſe of this Muſcle, as hath been ſaid, is to ſuſtain the Eye, leſt by looking continually down toward the ground, it ſhould hang too much outward; and by it alſo the tonick motion is performed.

Having diſcourſed of theſe ſeveral Muſcles and of their ſeveral actions and uſes, I think it very neceſſary to ſet down the manner of raiſing them, that he that will take the pains to examine them in the Creature it ſelf, may the better find them, without violating of them unawares, whereby he will loſe his labour, and miſs of ſatisfaction in the inquiry after them.

The manner of raiſing the Muſcles of the Eye.

You muſt then, after the taking the Eye and all its appurtenances clear out of the Orbit (if you will make your diſſection that way; but if you will take the pains to remove the Bones of the Orbit and not cut the Eye out, it will be much better, for then you are ſure to ſee the Muſcles in their natural ſituation: but whether you remove the Bones, or take the Eye out, you muſt I ſay) make your diſſection on this manner: Firſt, you muſt with a pair of Sciſſers cut off the Fat and the Skins before you raiſe any of the Muſcles, making them as clean as you can. Then begin with them in order thus: firſt raiſe the larger or upper oblique Muſcle, then the leſſer or lower oblique; then the four ſtreight Muſcles: but you muſt onely raiſe the larger oblique Muſcle and not remove it, untill you have ſeen and removed the other five; for when the others are removed, you will the plainer perceive how the Tendon of the ſaid Muſcle paſſeth through the Pully, that is ſeated in the inner corner of the Eye.

After you have had a full view of theſe Muſcles before named, then mind the laſt and ſeventh Muſcle, which ſtill encompaſſeth the Optick Nerve, reaching from the place where the other Muſcles had their riſe, quite down to the hinder hemiſphere of the Eye.

CHAP. IV.

Of the Muſcles of the Noſe.

THE *Noſe* of an Horſe ſo far as it is griſtly, is moved ſeveral ways, which motions are performed by theſe following Muſcles. Firſt it is drawn together to ſhut the Noſtrils by the *Adducent* or *Claudent* Muſcles: and ſecondly it is drawn aſunder to open the Noſtrils by the *Abducent* or *Aperient* Muſcles. And to the performing each motion there belong two pair of Muſcles; ſo that in all there are eight Muſcles that belong to the Noſe. I ſhall deſcribe the two latter pair firſt, whereof

The firſt pair of Abducent *Muſcles.*

The firſt pair ariſes from the upper Jaw-bone, near the firſt proper pair of the Lips, and is inſerted partly into the lower part of the *Alæ*, or griſtly circumference of the Noſtrils, and partly into the upper part of the upper Lip.

The ſecond pair. The other pair begins at the top of the Noſe near the Eye, with an acute and fleſhy beginning, whence deſcending ſomewhat ſlantingly, and in its paſſage lying upon each ſide of the Noſe, it doth at laſt end at the *Alæ*, as the other pair did, but with a broader and fleſhier end. Each of theſe Muſcles being narrow at the beginning, and ending broad, is in ſhape triangular or three-ſquare, like the Greek Letter Δ *delta*, from whence it is called by ſome *deltoides*. The uſe of this pair, as alſo of the former, is to draw the griſtly circumference or wings of the Noſtrils upwards, and ſo to widen and open them.

The firſt pair of Adducent *Muſcles.* The other two pair are called the *Adducent* or cloſing Muſcles; the firſt pair of which is *external*, ariſing about the root of the Griſtle, and aſcending croſs-ways to the ridg or tip of the Noſe, into which it is inſerted. This pair is more fleſhy than the other, though indeed there is not much Fleſh in any of the Muſcles of the Noſe, and therefore it will require a very accurate Anatomiſt to raiſe any of them, and to diſtinguiſh them.

The ſecond pair. The ſecond pair of the cloſing Muſcles are *internal*, and are hid in the Cavity of the Noſtrils under the inner Coat that cloaths them. Theſe are not ſo fleſhy as the former. They ariſe from the end of the Bone of the Noſe, and ſpreading into a kind of membranous ſubſtance, they deſcend to the griſtly circumference of the Noſtrils where they terminate.

The firſt pair of theſe Muſcles being contracted depreſs the *Alæ* or Griſtles of the Noſe, and the latter pair draw them inwards, and ſo cloſe the Noſtrils; to which motion the orbicular or round Muſcle of the upper Lip is aſſiſtant, for by its drawing the upper Lip downwards, it doth at the ſame time conſtringe or ſtraiten the Noſtrils.

CHAP. V.

Of the Muſcles of the Lips and Cheeks.

TO the *Lips* do belong ſeveral pair of Muſcles, ſome of which are *proper* to the *Lips* alone, and others are *common* both to the *Cheeks* and *Lips*.

The firſt common Muſcle, called the fourſquare *Muſcle.* The *common* are on each ſide of the Face two. The firſt of which is called *detrahens quadratus*, or the four-ſquare drawers aſide of the Cheeks and Lips. This ſhews more like a Skin than a Muſcle, being broad and thin, onely it is interlaced with fleſhy Fibres, which makes it to be accounted a Muſcle.

It ariſes from one of the Vertebres of the Neck on its outſide, as alſo from the Shoulder-blade, the Collar-bone and Breaſt-bone, from whence it aſcends with oblique or ſlanting Fibres up to the Chin, Lips, and root of the Noſe; which Parts it draws downwards with a ſlanting motion.

The ſecond common Muſcle, called the Trumpeter. The ſecond *common* Muſcle of the Cheeks and Lips, is called in Humane Bodies *Buccinator* the Trumpeter, becauſe in blowing a Trumpet the main ſtreſs lies upon this Muſcle; though others derive that name from *Bucca* the Cheek, becauſe it is the moſt conſiderable Muſcle of it,

and

and on this account it may retain the ſame name in an Horſe: or it may be called the *Contracter*, from its action, which is to contract the Cheek.

It ſprings from almoſt the whole length of the *upper* Jaw-bone, and is inſerted into the whole length of the *lower*, at the root of the Gums. It is thin and membranous, and interlaced with divers Fibres running ſundry ways; and hath the inner Coat of the Mouth ſo cloſely and firmly adhering to it, that it is ſcarce ſeparable from it. This Muſcle is ſeated under the upper part of the former, and is ſpread over the whole dimenſion of the Cheek.

Its *uſe* in Horſes and other Brutes is to be as a Hand to help the Mouth in its chewing motion; for as the Meat in chewing falls on the outſide of the Teeth, betwixt them and the Cheek, this Muſcle helps to turn it over the Teeth again, that it may be ſufficiently broken and ground, and made thereby the readier for concoction when it is turned down to the Stomach.

Beſides this office of aſſiſting in chewing, it doth ſerve alſo at other times upon any occaſion to move the Cheeks and Lips.

Next come we to the Muſcles that are *proper* to the *Lips* onely, and thoſe are by Anatomiſts accounted five pair and one odd one. The firſt of them is called *par Attollens*, or Lifters up of the Lip. This pair ſpring from the upper Jaw, where it makes the hollow of the Cheek. At their riſe they are broad and fleſhy, from thence paſſing down obliquely along the Cheeks, each of them is inſerted into its own ſide of the upper Lip, near the Noſe. The *uſe* of theſe Muſcles, if they both of them act together, is to draw the upper Lip directly upwards and outwards; but if onely one acts, then is but one ſide of the Lip drawn upward obliquely. You may plainly ſee theſe Muſcles work, if you take notice of a Ston'd Horſe after he hath ſmelt to a Mare; for then he will moſt times hold up his Head in the Air, and turn up his upper Lip till he hath almoſt turned it inſide outwards. And the like you may ſee many Horſes doe, if you onely let them ſmell to another Horſe's Dung.

The firſt proper pair of Muſcles of the Lips, called par Attollens.

The *ſecond* pair is called *Abducens*, the Drawers of the Lip on one ſide. This ariſes at the Cavity that is under the *Os jugale* with a fleſhy and round beginning, which is cover'd with ſome Fat, eſpecially in fat Horſes; from whence they run down on each ſide to the middle of the upper Lip, into which they are inſerted with a ſtrong round Tendon. Theſe jointly move the Lips upwards and outwards as the former did, aſſiſting them in their motion; and when either of them acts ſingly, then it aſſiſts the action of one of the former that is on its own ſide, and helps to draw the Lip upwards of one ſide.

The ſecond pair, called par Abducens.

The *third* pair is called by *Riolanus*, *Zugomaticum* or *Jugale*, from its riſe, which is outwardly from the proceſs of the *Os jugale*. At their beginning they are fleſhy and ſomewhat round, and running downward a little overthwart the Cheeks they reach at laſt to the ſides of the upper Lip, where they are inſerted near the corner of the Mouth. The *uſe* of this pair is to draw the Lip upwards ſideways.

The third pair, called Zugomaticum.

The *fourth* pair is called *Deprimens*, or the Drawers down of the lower Lip. Theſe ariſe fleſhy and broad from the lowermoſt and outwardmoſt part of the Lower Mandible; from whence each marches obliquely to the under Lip, into which they are inſerted about the middle of it. The uſe of this pair is to draw the under Lip downwards and ſomewhat out-

The fourth pair, called Deprimens.

wards. So that it joineth in the ſame action with the firſt pair of the common Muſcles called *Detrahens quadratus*.

The fifth pair, called Obliquè detrahens.

The *fifth* pair is called *Obliquè detrahens*, from their office, which is to draw the lower Lip obliquely downwards and outwards. They take their beginning from the ſides of the lower Jaw, where they riſe with a fleſhy and broad head; from whence they aſcend upwards, growing in their paſſage ſomething narrower, and are each inſerted into the corners of the lower Lip. The *uſe* of this pair is, as hath been ſaid, to draw the lower Lip obliquely downwards and outwards.

The odd Muſcle, called Orbicularis.

In the next place we come to the odd Muſcle, called *Orbicularis*, or orbicular, becauſe it goes round the circuit of both the Lips. It is alſo called *Conſtringens*, becauſe it ſerves as it were for a Sphincter Muſcle to purſe up or contract the Lips. Beſides theſe names it has in Men that of *Oſculatorius*, the Kiſſing Muſcle, becauſe it contracts or draws the Lips together in kiſſing. It ſticks very cloſe to the Skin of the Lips, and makes up the greateſt part of their ſubſtance.

CHAP. VI.

Of the Muſcles of the lower Jaw.

THE *upper Jaw* being immoveable hath no Muſcles, there being no occaſion for them where there is no motion, which is their onely uſe. But the *lower Jaw* which hath motions of divers ſorts, doth require divers ſorts of Muſcles to perform them. Now theſe Muſcles are in number five pair.

The firſt pair of Muſcles called the Temporal.

The *firſt* pair of theſe Muſcles is called the *Temporal*, becauſe they are ſeated upon the Temples. They ſpring on each ſide from the Bones of the Brow or Fore-head, the *Synciput*, Temples and Wedge-like Bone. They are the ſtrongeſt and largeſt of all the five pair. Their beginning is fleſhy, large and ſemicircular, their inſide lying upon the *Perioſteum*, and their outſide covered with the *Pericranium*. They deſcend under the *Os jugale* to the acute Proceſs of the lower Jaw, into which they are inſerted by a ſhort but very ſtrong Tendon. Theſe Muſcles with great force pull up the lower Jaw, and ſo ſhut the Mouth.

The ſecond pair, called Deprimens.

The *ſecond* pair hath the name of *Deprimens*, becauſe they pull down the Jaw. They are alſo from their ſhape, having as it were two bellies, called *biventre*. Theſe being aſſiſted by the *quadrati*, which were deſcribed in the foregoing Chapter (being one of the pairs that are common to the Cheeks and Lips) pull down the Jaw, and ſo open the Mouth. They ariſe with a broad and nervous beginning from the Proceſs of the Temple-bone called *Styloides*, and ſuddenly becoming round, fleſhy and ſmall, they paſs downwards, and in their middle where they come to the flexure of the lower Jaw-bone, they loſe their fleſhy ſubſtance and degenerate into a nervous and round Tendon, and then becoming fleſhy again they are inſerted into the inner ſide of the lower Jaw at the middle or fore-part of it.

The

The *third* pair is called *Maſſeteres*, becauſe they are very aſſiſtant in the office of *chewing*, by moving the Jaw to the right and left ſide. Each hath two beginnings: the firſt is large, ſtrong and nervous, ariſing from that Suture where the fourth and firſt Bone of the upper Jaw are joined; the other beginning is fleſhy, ſpringing from the *Os jugale*. They are firmly and largely inſerted into the outſide of the lower Jaw. Theſe Muſcles, by reaſon of their diverſity of Fibres, move the nether Jaw both forwards, backwards and to the ſides, and ſo in a manner circularly. *The third pair, called* Maſſeteres.

The *fourth* pair are called *Pterygoideum externum*, as if they reſembled a pair of *Wings*. Theſe like the former have alſo a double beginning, partly nervous, and partly fleſhy. They ſpring partly from the upper and outward ſide of the Wing-like Proceſs of the Wedge-like Bone, and partly from the rough and ſharp line of the ſame Bone, from whence they march down with ſtreight Fibres, becoming in their courſe larger and thicker, till they come to the lateral part of the lower Jaw, into whoſe inſide they are inſerted with a ſtrong Tendon. The *uſe* of this pair of Muſcles is to open the Jaw and move it forward, which appeareth when the Teeth of the lower Jaw are ſtretched farther out than thoſe of the upper. *The fourth pair, called* Pterygoideum externum.

The *fifth* and laſt pair of Muſcles of the lower Jaw are called *Pterygoideum internum*. Theſe ariſe with a nervous beginning from the inner ſide or cavity of the Wedge-like Bone, at its wing-like Proceſs; then becoming fleſhy, large and thick, they march down with a ſtreight paſſage to the inner and hinder part of the lower Jaw, where they are inſerted by a nervous, broad and ſtrong Tendon. The *uſe* of theſe Muſcles is to draw the Jaw towards its head or backwards; and alſo to help the Temporal Muſcle to draw the Jaw up. *The fifth pair, called* Pterygoideum internum.

CHAP. VII.

Of the Muſcles of the Ear.

THE Muſcles of the *Ears* in Brutes (eſpecially ſuch as have large Ears, as Horſes, Aſſes, Oxen, Hares, *&c.*) differ much in magnitude from thoſe of Men, in whom they are ſo very ſmall, that *Galen* calls them, the lineaments of Muſcles. The reaſon of which is, that in Man the Ears are moſt commonly immoveable, (though there have been ſome that could move them) and therefore to have large Muſcles were needleſs; and yet to have none at all, would look like a defect in the moſt perfect of all Animals. But though Man cannot move his Ears, yet is that no prejudice to his hearing; for the want of that motion is recompenced by the eaſie and ſpeedy motions of his Head, whereby he can turn it on every ſide to receive the ſounds; whereas four-footed Beaſts, that have the motions of their Heads not ſo nimble, have need to have their Ears always moveable every-way, to receive the ſounds from every ſide: and their moveableneſs has alſo a further uſe, to wit, to drive away

Flies

Flies and other Inſects that are troubleſome to the Beaſt, which Men can doe with their Hands.

The External Ear hath four Muſcles.

The Ear we divided, in the former Book, into the *Outward* and *Inward*. The *Outward* (of which we have been diſcourſing thus far in this Chapter) has four Muſcles; and theſe are thoſe which are ſo much larger in Brutes than Men. The *Inward* Ear has two, which are of a proportionable largeneſs in both.

1. *The lifter up of the Ear.*

The firſt of theſe we come to treat of is the *firſt* of the *Outward* Ear, which goes by the name of *Attollens Aurem*, the lifter or puller up of the Ear. This ariſes at the outſide of the Frontal or Forehead Muſcle, and at its riſe is thin and membranous; from whence being carried over the Temporal Muſcle, and growing in its courſe ſomething narrower, it doth at laſt inſert it ſelf into the upper part of the Ear, moving it upwards and forwards.

2. *The puller back of the Ear.*

The *ſecond* is called *Detrahens Aurem*, or the puller back of the Ear. This Muſcle ariſes from the Mammillary Proceſs with a fleſhy, broad and fibrous head; and ſo growing narrower in its progreſs is at length inſerted into the root of the Griſtle of the Ear, ſometimes by two, ſometimes by three Tendons. The *uſe* of this Muſcle is to draw the Ear backwards and ſomewhat upwards.

3. Adducens Aurem.

The *third* is called *Adducens Aurem*, by which the Ear is drawn forwards and ſomewhat downwards. This is ſaid to be but a part of the *muſculus quadratus* before ſpoken of in the fifth Chapter of this Book, being one of the common Muſcles of the Cheeks and Lips. This Muſcle aſcending with its Fibres is implanted into the lower ſide of the root of the Ear.

4. Abducens Aurem.

The *fourth* is called *Abducens Aurem*, becauſe it draws or pulls the Ear backwards. This takes its beginning at the *Occiput* or back-part of the Head from the Coat that cloaths thoſe Muſcles that belong to that part, where it is at firſt ſomething narrow, but afterward waxing broader it is carried tranſverſly to the hinder part of the Ear, into which it is inſerted. This aſſiſts the ſecond in its action, having ſometimes two, and ſometimes three Tendons as that has.

The Inward Ear hath two.

1. *The External.*

The next are the two Muſcles of the *Inner* Ear (called *Auris*, as the *Outward* Ear is called *Auricula*) the firſt of which is called *Externus Tympani Auris*, or the external Muſcle of the Drum of the Ear, becauſe it moves the Membrane of the Ear ſo called upwards and outwards. This is thin but broad at its riſe, which is from the upper part of the paſſage of the Ear; then becoming narrower it grows into a very fine and ſmall Tendon, which is carried on the outſide of the *Tympanum* till it arrive at its centre or middle into which it is inſerted, where on the inſide of this *Tympanum* the little Bone called the Hammer ſticketh, which with the Membrane or *Tympanum* this Muſcle draweth a little outward and upward. This Muſcle as alſo the next are very ſmall, there being ſcarce any in the whole Body again ſo ſmall as they are; and therefore it will require great skill to raiſe them without violating of them. To prevent which the undertaker is to open with great care the *Os petroſum* which is to be done on that ſide which is next to the Temples, taking out the pieces of Bones by degrees that theſe Muſcles may receive no prejudice. It is left to the diſcretion of the Diſſector whether he will remove the Bones with a Chiſſel, or Saw, or by filing, ſo he doe it carefully.

The

The ſecond is called *Internus*, and hath its origination from the bottom of the *Os cuneiforme* or Wedge-like Bone, there where it is joined with the *Proceſſus petroſus*. It is ſeated inwardly in the Cavity of the *Os petroſum*, being fleſhy at its beginning, yet thin and ſmall: at its middle it is divided into two very ſmall and very thin Tendons, whereof one is inſerted into the upper Proceſs of the *Malleus* or Hammer, and the other into the neck of it. The *uſe* of this Muſcle, alone, is to draw the head of the Hammer obliquely forwards, and alſo to draw it ſomewhat inwards: but when theſe two act both together, they move the *Tympanum* with its ſmall Bones upwards and downwards, which is done when the Horſe would carefully liſten or harken to any approaching noiſe.

2. *The Internal.*

CHAP. VIII.

Of the Muſcles of the Tongue.

THE *Tongue* in Brutes hath but two principal uſes, *viz.* to taſte the Food, and to rowl it up and down the Mouth: but in Men it has a third uſe, which is to be the main inſtrument of Speech. Yet notwithſtanding there are as many Muſcles that belong to it in Brutes as there do in Men; for in ſome regard it has a further uſe in them than in Men, ſeeing it does not onely taſte and rowl about the Meat, but it ſerves alſo to gather it into the Mouth; for *that* they doe with their Tongue, becauſe they have not the help of Hands as we have. Wherefore that the Tongue might perform all theſe offices, it was neceſſary it ſhould be furniſhed with variety of Muſcles, to make it capable of being moved every way, outward and inward, upward and downward, and ſideways. And leſt in undergoing theſe motions it ſhould be made to reach farther than is neceſſary, Nature hath reſtrained it with a ſtrong Ligament underneath, which in Men is called the *Frænum* or Bridle of the Tongue.

The *Tongue* therefore hath five pair of Muſcles *proper* to it ſelf, beſides thoſe that are *common* to it and the *Os hyoides*, of which in the following Chapter.

The Tongue hath five pair of proper Muſcles.

The *firſt* pair *proper* to it is called *Genioglоſſum* (or the Chin-tongue pair) ſo called becauſe their riſe is from the Chin, and their inſertion into the Tongue. This name is proper enough in Men who have Chins, but agrees not ſo well with them in Horſes (or other Brutes) in whom we call all that part below the Teeth, *the lower Jaw*, not diſtinguiſhing any part of it by the name of *the Chin*. But notwithſtanding I ſhall deſcribe them by that name, becauſe it would be too tedious and too bold an undertaking for me to invent new names for this as well as for others that are in Brutes as improperly called by ſuch names as this pair is; leaving ſuch an attempt to thoſe that have both more leiſure, and that make a greater figure in the Anatomical Province.

1. Genioglоſſum.

This pair ariſe from the ruggedneſs which is in the middle of the lower Jaw before, in the inner and lower part of it. In their progreſs they are ſaid to have ſeveral ſuch inſcriptions as the ſtreight Muſcles of the Paunch

Paunch have, as if each conſiſted of ſeveral Muſcles; however that be, they reach to the middle of the Tongue where they are inſerted into its lower ſide. Their *uſe* is to move the Tongue forwards, towards the Fore-teeth, and many times out of the Mouth, that is, when the Beaſt gathers in his Meat.

2. Hypſilogloſſum. The *ſecond* pair is called *Hypſilogloſſum*, (which word ſhould be writ without an H, ſeeing they have this name becauſe they riſe from the bottom of the *Os hyoides*, which is otherwiſe called *Ipſiloides*,) from its reſembling in ſhape the Greek Letter υ (*Ipſilon.*) They end in the middle of the Tongue, and have an action contrary to the former; for as thoſe mov'd the Tongue outward, ſo theſe move it ſtreight inward or backward.

3. Myloglo ſſum. The *third* pair is called *Myloglo ſſum*, from the places of its riſe and inſertion; for they ariſe from the inner part of the lower Jaw, at the roots of the fartheſt *grinding Teeth*, and are inſerted into the Ligament by which the *Tongue* is tied to the *fauces* or Jaws. If this pair work together, they draw the Tongue downwards; but if onely one of them work, then it draws the Tongue obliquely to its own ſide.

4. Ceratogloſſum. The *fourth* pair is called *Ceratogloſſum*, becauſe they ariſe from the *horns* of the *Os hyoides*, and reaching from thence to the ſides of the *Tongue* are there inſerted into it. If one of theſe work alone, it draws the Tongue aſlant to either the right or left ſide; but if both work together, they draw the Tongue downwards and inwards.

5. Styloglo ſſum. The *fifth* and laſt pair of Muſcles *proper* to the Tongue are called *Styloglo ſſum*, becauſe they ariſe from the *Styloides* (or Pen-like) Proceſs of the Temple-bones, being fleſhy at their beginning, though very ſmall and ſharp; but afterwards becoming broader and thicker, they run to the ſides of the Tongue, into which they are inſerted about the middle of its length. If either of theſe Muſcles move ſingly, the Tongue is drawn to the right, or left ſide; but if both act together, they pull the Tongue upwards and inwards.

CHAP.

CHAP. IX.

Of the Muſcles of the Bone of the Tongue, called Os hyoides.

THE Muſcles of the Cheeks and Tongue ſerving to toſs the Meat to and again in the Mouth, and thoſe of the lower Jaw helping to chew or grind it; after it is ſufficiently minced, it wants afterward to be ſwallowed and to be tranſmitted into the Stomach. Now none of the foreſaid Muſcles contribute any thing thereto, therefore it was neceſſary there ſhould be others appropriated thereto, which by moving diverſly the root of the Tongue might make way for the morſel to deſcend into the Gullet. Such are thoſe that are common to the Tongue and the Bone called *hyoides* that is faſten'd to its root or baſis, which are in number four pair. *The* Os hyoides *hath four pair.*

The *firſt* pair is called *Sternohyoideum*, becauſe they ſpring from the upper but inner part of the *Sternum* or Breaſt-bone (with a broad and fleſhy beginning) and aſcending under the Skin of the Neck by the Wind-pipe (ſtill keeping the ſame largeneſs and ſubſtance) are at length inſerted into the root or bottom of the *Os hyoides*, which they move downward and backward. 1. Sternohyoideum.

The *ſecond* pair is oppoſite to the former, and is called *Geniohyoideum.* Theſe are large, ſhort and fleſhy all over, and ariſe with Fibres of a divers courſe, from the inſide of the fore-part of the lower Jaw (called in Men the *Chin*) and are inſerted into the middle part of the Bone *hyoides*, which they draw ſtreight upwards and a little forwards. 2. Geniohyoideum.

The *third* pair is called *Coracohyoideum.* Theſe are ſlender, but ſtrong, and long; yea conſidering the ſlenderneſs of them, they are the longeſt Muſcles of the whole Body. They ariſe out of the Proceſs called *Coracoides* at the upper end of the Shoulder-blade near the Neck, and run obliquely upward under the firſt pair of Muſcles of the Head called *Maſtoideum*, where they loſe their fleſhy ſubſtance, as giving way to the other that are more worthy and conſiderable than themſelves, and degenerate each into a nervous and round Tendon for ſome time; but ſo ſoon as they are paſt theſe Muſcles, they become muſculous again, and ſo continue till they reach to the *Os hyoides*, into whoſe horns they are inſerted. Theſe becauſe of their two bellies are by ſome called Digaſtricks. Their *uſe* is to pull the *Os hyoides* obliquely downwards. 3. Coracohyoideum.

The *fourth* and laſt pair of Muſcles of the *Os hyoides* is called *Styloceratohyoideum.* Theſe ariſe from the root of the Appendix or Proceſs called *Styloides*, and end in the *horns* of *Os hyoides.* They move the Bone obliquely upwards. 4. Styloceratohyoideum.

I hope the Engliſh Reader will pardon me for not tranſlating the names of theſe Muſcles, for it is impoſſible for any Man to doe it, ſeeing our Engliſh Tongue is not capable of ſuch compoſitions as the Greek admits of, from whence theſe names are borrowed: but he will ſee the reaſons of the names, if he obſerve but the parts from whence the Muſcles are ſaid to riſe, and into which they are inſerted, in the deſcription of them.

CHAP. X.

Of the Muſcles of the Larynx *or Throttle.*

The Larynx *hath two pair of* common *Muſcles*, viz.

THE *Larynx* in Mankind is the main inſtrument in modulating or forming the Voice, ſo as to make the tone high or low, *&c.* And though few Beaſts can alter their tones with that variety that a Man can, yet have they the ſame number of Muſcles to move the ſeveral Griſtles whereof the *Larynx* is compoſed. Now its Muſcles are either *proper*, or *common*. The *common* are thoſe that are implanted into the *Larynx*, but ariſe not therefrom; and the *proper* are thoſe that both ariſe and end in the *Larynx*. The *common* are four, and the *proper* nine.

1. Sternothyreoideum.

The *firſt* of the *common* pair is called *Sternothyreoideum*, and by ſome *Bronchium*, or the Weazand-muſcles. Theſe ariſe with a fleſhy and broad beginning from the upper and inner part of the *Sternum* or Breaſt-bone at the very Throat, aſcending with right or ſtreight Fibres up by the ſides of the Wind-pipe, continuing the ſame largeneſs and ſubſtance till they reach to the *Cartilago thyreoides*, or Shield-faſhioned Griſtle, into which they are inſerted. Their *uſe* is to draw down the ſaid Griſtle, and ſo to widen the Chink as ſome Authours think; though others are of opinion that ſuch drawing of it down, ſerves to ſtraiten the Chink.

2. Hyothyreoideum.

The *ſecond* pair is called *Hyothyreoideum*. Theſe ariſe from the lower ſide of the Bone *hyoides*, having a broad and fleſhy beginning; from whence deſcending with ſtreight Fibres they are inſerted into the *Cartilago thyreoides*; by lifting which upwards they are ſaid to ſtraiten the Chink of the *Larynx*; though ſome on the contrary affirm that they widen it.

and four pair proper *ones and an odd one*, viz.

Next come we to the *proper* Muſcles of the *Larynx*, the *firſt* pair of which is called *Cricothyreoideum anticum*, becauſe they take their beginning from the *fore-part* of the Ring-faſhioned Griſtle called *Cricoides*, and proceed obliquely to the Shield-faſhioned Griſtle or *Thyreoides*, into whoſe ſides they are implanted. The *uſe* of this pair of Muſcles is to move the Shield-faſhioned Griſtle or *Thyreoides* obliquely downwards, and by that means to open the *glottis* or Chink of the *Larynx*.

1. Cricothyreoideum.

2. Cricoarytænoideum poſticum.

The *ſecond* of the *proper* pairs of Muſcles of the *Larynx* are called *Cricoarytænoideum poſticum*. Theſe contrary to the former ariſe from the lower and *back-part* of the Ring-faſhioned Griſtle, and running upward with ſtreight Fibres are inſerted with a nervous end into the lower ſide of the *Arytænoides* or Ewer-like Griſtle, which it pulls upward and backward, and thereby opens and widens the *Larynx*.

3. Cricoarytænoideum laterale.

The *third* pair is called *Cricoarytænoideum laterale*, becauſe they are ſeated at the *ſides* of the former pair. They ariſe from the ſides of the Anulary or Ring-faſhioned Cartilage ſomewhat ſlender; from whence proceeding directly upwards, and becoming more large and fleſhy, they come to the *Arytænoides*, into the ſides of which they are implanted in that part that the foregoing pair did not cover. The *uſe* of this pair is to open the *Larynx* by drawing the Griſtles obliquely aſide.

The

The *fourth* pair is called *Thyreoarytænoideum.* Theſe are the largeſt and ſtrongeſt of all the proper Muſcles of the *Larynx*, yea almoſt equal to all the reſt put together. They ariſe cloſe one to the other from the inner hollow and middle part of the *Thyreoides* or Shield-faſhioned Griſtle, whoſe inner Cavity they fill through the whole length of it, and with oblique Fibres they aſcend upward, growing narrower in their aſcent, till they come to their inſertion into the ſides of the Ewer-like Griſtle. Theſe are the Muſcles that are principally affected in Humane Bodies when they are in the greateſt danger from that Diſeaſe called the Squinancy or Quinſie. For when theſe Muſcles are inflamed, they ſwell inwards into the Throttle, and make the Cavity thereof ſo ſtrait, that the Patient cannot fetch his breath, but is ſtrangled.

4. Thyreoarytænoideum.

The *fifth* and laſt is reckoned but for one ſingle Muſcle, and is called *Arytænoides*, alſo *Claudens ſecundum*, or the ſecond Shutting-muſcle. They take their riſe from the hinder line of the Ewer-like Griſtle or *Arytænoides* from whence it hath its name. It is very ſmall but fleſhy, and running with tranſverſe Fibres, it is inſerted into the ſides of the ſame Griſtle, which it helps to conſtringe or draw both its ſides together, and ſo ſtraitens the Throttle.

5. *The Muſcle* Arytænoides.

The *Epiglottis* or Throat-flap, that covers the Chink of the *Larynx* has no diſcernible Muſcles in Man, nor I believe in an Horſe: but in Cattle, Sheep, *&c.* that chew the Cud, it is ſaid to have evident ones; ſome of which ſpring from the *Os hyoides*, and are inſerted into the baſis of the *Epiglottis*, which they lift up; and others are placed between the Coat and Griſtle of the *Epiglottis*, helping it to ſhut the *Larynx*.

CHAP. XI.

Of the Muſcles of the Uvula *and Throat.*

THE *Uvula* is ſaid to have two Muſcles to hold it up, *one* of which is called *Pterygoſtaphilinus externus*. This ſpringeth from the upper Jaw a little beyond the furthermoſt Grinder, and is inſerted into the *Uvula*.

The Uvula *hath two Muſcles.*

1. Pterygoſtaphilinus externus.

The *ſecond* is called *Pterygoſtaphilinus internus*. This proceeds from the lower part of the inner Wing of the Proceſs *Pterygoides* (or Wing-like) and is inſerted in like manner as the former into the *Uvula*.

2. Pterygoſtaphilinus internus.

This is the deſcription that Anatomiſts commonly give of theſe two Muſcles; but it may be queſtion'd whether they are any more than imaginary ones; for ſeeing the *Uvula* has no apparent voluntary motion, it ſeems to have no occaſion for any Muſcles.

Next to the Muſcles of the *Uvula* come thoſe of the *Throat* (or the beginning of the Gullet called *Pharynx*) to be treated of, to which belong ſeven Muſcles, that is, three pair and a Sphincter. The *firſt* of the pairs is called *Sphenopharyngæum*. Theſe ariſe thin and nervous from the Appendix of the Wedgelike-bone, deſcending by the inward Cavity of its

The Pharynx *hath ſeven Muſcles.*

1. *Par* Sphenopharyngæum.

Wing-like Proceſſes, and are inſerted into the lateral parts of the Palate and *Pharynx*, which they widen in ſwallowing.

2. Cephalo-pharyngæum.

The *next* pair is called *Cephalopharyngæum.* Theſe ſpring from that part where the *Head* is joined to the firſt *Vertebra* of the Neck, from whence they deſcend to the *Pharynx*, into which they are ſpread with a large *plexus* of Fibres, which ſeemeth to make its Membrane. The action of this pair is contrary to the former; for as thoſe widen the *Pharynx* to let the nouriſhment deſcend into the Gullet, ſo theſe ſtraiten it when the Food is paſt by it, and thereby ſqueeze the Food down the Gullet.

3. Stylopharyngæum.

The *third* pair is called *Stylopharyngæum.* Theſe ariſe with a ſmall beginning from the inner part of the *Styloides* Proceſs of the Temple-bone, and deſcending with a thin body are inſerted into the ſides of the *Pharynx* which they dilate or widen.

4. *The Muſcle* Oeſophagiæus.

The *laſt* of theſe Muſcles is that which hath no fellow, and is called *Oeſophagiæus*, or the Sphincter of the Gullet. This ariſes at one ſide of the *Thyreoides*, or Shield-faſhioned Griſtle, and is inſerted into the other ſide of the ſame, wholly encompaſſing in its courſe both the fore and back part of the Gullet, in the ſame manner as the Sphincters of the *Anus* and Bladder do thoſe Parts, ſerving here for the ſame uſe, *viz.* to draw or purſe in the mouth of the Gullet, as thoſe do the Arſe and Bladder. Now though I have the warrant of ſeveral Authours in deſcribing of this Muſcle laſt of the ſeven, yet there be others that treat firſt of it, and reckon it the firſt Muſcle of the Throat, ſaying, that if you firſt raiſe this, the two next before-mentioned pairs, namely, the *Stylopharyngæum* and the *Cephalopharyngæum*, may be the better found.

Two pair of Muſcles lately found out by Doctor Croune, *viz.*

Having done with the Muſcles of the *Uvula* and Throat, as alſo with all the Muſcles of the inward and outward Parts of the Mouth and Chaps, according as they are treated of by the Ancient and Modern Anatomizers of theſe Parts; it remains now that I ſhould deſcend to the Muſcles of the Head and Neck, and ſo to the inferiour Parts; but before I depart quite from hence, I think it neceſſary to give the Reader an account of two pair of Muſcles more, which belong to the Palate of the Mouth, never treated of by any Anatomiſt yet, ſave Mr. *Brown*, who in his Book of the Muſcles lately ſet forth, gives the firſt account of them, at the deſire of the diſcoverer of them, which was the moſt ingenious Doctor *Croune* now living, and at this time Lecturer at Chirurgeons Hall in *London*.

This worthy and learned Diſcoverer hath given them theſe names following; the firſt he calls *Muſculi Pterygo-palatini*, and the other *Spheno-palatini*.

Pterygo-palatini, *and*

This deſcription hath he alſo given of them, *viz.* The firſt or *Pterygo-palatini* are ſeated in the lower part of the Cavity of the Wing-like Proceſſes of the Wedge-like Bone, and terminate about the *Glandula palati* with their Tendons, which run upon part of the fore-mentioned Proceſſes, as on two *Trochleæ* or Pullies. The *uſe* of this pair is to depreſs the before-named Gland of the Palate and the *Uvula*.

Spheno-palatini.

The latter of them, which he calls *Spheno-palatini*, have an uſe contrary to the former, *viz.* to lift up the fore-mentioned Gland and *Uvula*. Their riſe is from the *Os ſphenoides* or Wedge-like Bone, and their inſertion (with a broader Tendon than the former) into the ſides of the before-mentioned Gland and *Uvula*. It is believed from the ſituation and action of this laſt pair of Muſcles, that when the Rheum that had ſwelled the Gland

Gland and relaxt the *Uvula*, is drained away, theſe Muſcles help to reduce the *Uvula* to its proper and natural ſituation; though to me it ſeems, that its own contracting of it ſelf is ſufficient.

CHAP. XII.

Of the Muſcles of the Head.

THE Muſcles of the *Head* are either *proper* or *common*. The *common* are thoſe which primarily move the Neck, and the Head onely ſecondarily, of which in the next Chapter; for according to order the *proper* are firſt to be ſpoken to, and theſe are they that move the Head onely, the Neck at that time remaining unmoved, the number of which are ſixteen, or eight pair. *The Head hath eight pair of proper Muſcles.*

The *firſt* pair is called *Maſtoideum* (which pair ſome Authours indeed reckon for the eighth or laſt pair, and the *Splenium* for the firſt; but being willing to follow the more modern Writers I will begin with the *Maſtoideum* and reckon them for the firſt pair.) 1. Maſtoideum.

Theſe are ſeated in the fore-part of the Neck, having each a double beginning; one of which is from the Breaſt-bone, being altogether nervous, and the other from the Collar-bone, which is fleſhy. From theſe originals they aſcend obliquely upwards by the Neck, till they come to the hinder part of the Head, *viz.* to the Mammillary Proceſs of the Temple-bone, into which each is inſerted by a round and fleſhy Tendon. If both theſe Muſcles work together, then they bend the Head right forward or downward; but if one onely works, then that draws the Head a little to one ſide. Of all the eight pair there are onely this that bend the Head ſtreight forward, and that are placed in the fore-part of the Neck; for all the reſt are ſeated behind towards the Mane, and do either pull the Head back, or elſe to one ſide.

The *ſecond* pair (or firſt pullers back of the Head) is called *Splenium*. Theſe are long and thick, ariſing from the five uppermoſt *Vertebræ* of the Cheſt and five lowermoſt of the Neck, with a nervous beginning; from whence aſcending to the hinder part of the Head, they there end with a broad and fleſhy Tendon. The uſe of theſe, if both of them act together, is to draw the Head directly backward; but if either of them act ſingly, then it draws the Head a little to one ſide. 2. Splenium.

The *third* pair, (being the ſecond puller back of the Head) is called *Complexum* or *Trigeminum*, becauſe each Muſcle ſeems to conſiſt of three, for it ariſes with three heads; one of which is from the tranſverſe Proceſs of the fourth and fifth *Vertebræ* of the Cheſt; the ſecond from the firſt and ſecond of the ſame, and the third from the ridge of the ſeventh *Vertebra* of the Neck: all which uniting into one body, the Muſcles aſcend upward as far as to the *Occiput* or Noll-bone, (in their courſe becoming fleſhy and broad) and are inſerted into the ſaid Noll-bone, at the root of the Mammillary Proceſs, ſometimes by one, and ſometimes by a triple Tendon. 3. Complexum.

The

4. Parvum & craſſum.

The third puller back of the Head, or *fourth* pair, is called *parvum & craſſum*, becauſe they are ſmall and thick. Theſe are ſituated under the former, ariſing from the tranſverſe Proceſſes of the ſix uppermoſt *Vertebræ* of the Neck, with a nervous beginning; but afterward becoming fleſhy, they are carried obliquely upward, and are inſerted into the hindermoſt root of the *Proceſſus Mammillaris*. Their *uſe* is, if they act both together, to bring the Head lightly backwards; and if but one act, then to bring it backward to one ſide.

5. Rectum majus.

The *fifth* pair is called *Rectum majus* or the greater right pair, being ſmall, fleſhy and ſlender, and ariſing from the tip of the Spine or ridge of the ſecond *Vertebra* of the Neck, where they touch one another; but preſently part, and aſcending both upward, end with a round Tendon in the middle of the Noll-bone or *Occiput*. The action of this pair is the ſame as of the former.

6. Rectum minus.

The *ſixth* pair (being the fifth of the pullers back) is called *Rectum minus*, or the leſſer right pair. Their ſituation is juſt under the former pair, as it were concealed, and are of the like ſubſtance, form and progreſs. They ariſe cloſe together from the back-part of the firſt *Vertebra* of the Neck where the Bone ſhould have ended in a Spine, but that Spine is wanting becauſe it would have offended the former pair of Muſcles that ſpring from the ſecond *Vertebra* and march over this. Preſently after their original they part, and aſcend upwards, and on either ſide are implanted into the Noll-bone. The *uſe* of theſe is to aſſiſt the motion of the two foregoing pair. Now the reaſon why there are ſo many Muſcles appointed to move the Head backward, and but one pair forward, is becauſe the Head by reaſon of its great bulk and weight, is prone enough of it ſelf to incline forward or downward; but it requireth a great force to move it upward or backward.

7. Obliquum ſuperius.

The *ſeventh* pair is called *Obliquum ſuperius*, or the upper Oblique pair. Theſe are ſeated under the right or ſtreight pairs, and are like them in form and ſubſtance. They are ſmall, ariſing out of the middle of the *Occiput* at the outſide of the ſtreight pairs, from whence they deſcend downwards, and are inſerted into the tips of the tranſverſe Proceſſes of the firſt *Vertebra* of the Neck, the right-hand Muſcle into the right Proceſs, and the left into the left. The *uſe* of theſe, if they both act together, is to nodd the Head gently directly backwards.

8. Obliquum inferius.

The *eighth* pair is called *Obliquum inferius*, or the lower Oblique pair. Theſe ariſe from the Spine or ridge of the ſecond *Vertebra* of the Neck, from whence running obliquely upwards, they end at the tranſverſe Proceſſes of the firſt *Vertebra* of the Neck. They are longiſh, round and fleſhy, and make (as do alſo the former) a Triangle of equal ſides.

The *uſe* of this pair is to move the Head as it were ſemicircularly, (for it cannot be moved quite round) the firſt *Vertebra* turning upon the Tooth-like Proceſs of the ſecond: but this motion is performed, when one of them onely acts at a time; for if both of them move or act together, then they either keep the Head ſteady (as ſome Authours conceive) or elſe draw it a very little backwards.

CHAP.

CHAP. XIII.

Of the Muſcles of the Neck.

THE Head is not onely moved by its *proper* Muſcles mentioned in the laſt Chapter, primarily; but ſecondarily alſo by other Muſcles belonging to the *Neck*, which are in number eight, on each ſide four, by the help of which the Neck is ſometimes bent forward, other times extended backward; it is alſo ſometimes drawn to one ſide, and ſometimes to the other: but there are more Muſcles to draw it backwards than either forwards or to one ſide, becauſe the labour is greater by reaſon of the weight of the Head and Neck (as was ſaid in the former Chapter.) There are therefore two pair of Muſcles to bend the Neck backward, namely the firſt and ſecond, which do alſo draw it a little obliquely; and the third and fourth pair draw it both forward and to one ſide, as both act together, or but one of each pair at a time. *The Muſcles common to the Head and Neck are four pair.*

The *firſt* pair of theſe is called *Spinatum*, becauſe they are ſeated amongſt the Spines of the *Vertebræ*. They ariſe from the roots of the Spines of the ſeven uppermoſt *Vertebræ* of the Cheſt, and five lowermoſt of the Neck, being ſeparated from one another onely by the tips of the Spines, and are inſerted into the whole lower ſide of the Spine of the ſecond *Vertebra* of the Neck. They bend the Neck backward, or a little obliquely. Some think that they have no original from the Spines of the Neck, but that they onely adhere to them in their paſſage. 1. Spinatum.

The *next* pair is called *Tranſverſale*, becauſe they both riſe from and are inſerted into the tranſverſe Proceſſes of the *Vertebræ*. They take their beginning from the roots of the tranſverſe Proceſſes of the ſix uppermoſt *Vertebræ* of the Cheſt; from whence aſcending by degrees they become ſtronger and thicker, and are inſerted into the outſides of all the tranſverſe Proceſſes of the Neck-bones. The *uſe* of this pair, as alſo of the former, is as hath been ſaid, to pull or draw the Neck directly backwards; but if one Muſcle of either pair work alone, it pulls the Neck with an oblique motion. 2. Tranſverſale.

The *third* is called *Longum*, or the Long pair. Theſe lie hid under the *Oeſophagus* or Gullet, wherefore they are by ſome called the Under-gullet-lurkers. They ariſe with a thin and ſharp but fleſhy beginning from the body of the fifth and ſixth *Vertebræ* of the Back, and as they aſcend upwards, are knit to the ſides of all the *Vertebræ*, till they come to the firſt or higheſt of the Neck, where each touching other they are both inſerted into its Proceſs. The uſe of this pair, when they work together, is to bend the Neck directly forward, and withall to incline the Head; but if one of them act alone, then is the Neck drawn towards that ſide on which the Muſcle moveth. 3. Longum.

The *fourth* and laſt pair of the Muſcles of the Neck is called *Scalenum* or *Triangulare*. Theſe by ſome Authours are accounted as the eighth pair of the Cheſt. They are ſeated on the ſides of the Neck inclining rather to the fore than hinder part of it. They take their beginning from the firſt Rib, ariſing fleſhy and large, and are inſerted into the inſide of all 4. Scalenum.

the

the tranſverſe Proceſſes of the *Vertebræ* of the Neck. Their *uſe* is the ſame with the foregoing pair. They are obſerved to be perforated or to have holes through them, by which Veins, Arteries and Nerves do paſs out of the Body into the Fore-legs.

Table XXXII.

Repreſenteth an Horſe ſtanding with his Face towards us, that one may have the fuller view of ſome of the Muſcles of the Head and Neck. It ſheweth alſo ſeveral other Muſcles, leſs perfectly.

AA *Shew the* par Maſtoideum.
BB *The Muſcles of the Shoulder-blade.*
CC *The* par Trigeminum *or* Complexum.
DD *That pair of Muſcles of the Neck called* Scalenum *or* Triangulare.
E *The Wind-pipe in its natural ſituation.*
FF *That pair of Muſcles of the Neck called* Longum, *removed from under the Gullet.*
GG *The pair of the Noſe called* Philtrum.
HH *The Adducent or cloſing Muſcles of the Noſtrils.*
II *The Muſcles of the Eye-lids.*
KK *The Temporal Muſcles.*
LL *The Muſcles of the Ears.*
M *The Frontal or Fore-head Muſcle.*
N *The* Cucullaris *or Monk's hood.*
O *The* Deltoides *of the Shoulder.*
P *The* Serratus major Anticus *(ſhrunk up, for naturally their Teeth reach to thoſe of the obliquely deſcending pair of the* Abdomen.)
QQ *The* Pectorales.
R *The* Obliquè deſcendens *of the* Abdomen, *a little ſhrunk up from the* Serratus major.
S *The* Deltoides *of the Thigh, (which I preſume to call ſo, for it is juſt of the ſame figure with that of the Shoulder.)*
T *The* Serratus poſticus.
VVV *The external Intercoſtal Muſcles.*
W X Y *The three Buttock Muſcles.*
Z *The* Vaſtus externus.
a *The* Sacrolumbus.
b *The* Longiſſimus dorſi.
c *The* Semiſpinatus.

CHAP.

TAB XXXIII

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CHAP. XIV.

Of the Muſcles of the Breaſt.

HAving diſpatched the Muſcles of the Head and Neck, we come in the next place to ſpeak to thoſe of the Cheſt or *Thorax*, in which are contained the principal Inſtruments of Life, the Heart and Lungs. Now the Lungs being the principal organs of Reſpiration, and wanting Muſcles whereby to dilate or contract themſelves, it was neceſſary they ſhould receive aſſiſtance from the Cheſt in which they are included, by the dilatation or contraction whereof, they might be alſo dilated and contracted. To which end the Cheſt is furniſhed with ſeveral Muſcles, ſome of which contract it in Expiration, that is, when the Horſe lets forth his breath, and others dilate it in Inſpiration, when he receives in his breath.

There are four pair of Muſcles that widen the Cheſt.

Of the Dilaters or thoſe that widen the Cheſt there are four pair, beſides the ſixteen pair of the External Intercoſtals, there being (as is already ſaid in Chap. 2. of the Second Book where I largely treated of them) between each Rib two Muſcles, an External and an Internal one. Now there being in number ſeventeen Ribs, reckoning a Rib for the extreme part both toward the Neck and toward the Flank, there muſt be one pair of Muſcles fewer than there are Ribs, of which thoſe that are ſeated externally, ſerve all as one Muſcle to aſſiſt in the widening or dilating the Cheſt, and thoſe that are ſeated internally (lying under the former) aſſiſt in the contraction of it. For a more full deſcription of theſe Muſcles you may pleaſe to turn back to the afore-cited Chapter.

1. Subclavium.

The *firſt* pair of the dilating or widening Muſcles is called *Subclavium*, from their ſituation, which is under the Collar-bone called *Clavicula*, for they fill up that ſpace that is between the Clavicle and the firſt Rib. Theſe ariſe fleſhy from the inner and lower part of the Clavicle or Collar-bone, which is next to the Rib, and running obliquely or ſlanting forward, are implanted into the firſt Rib near the Breaſt-bone with a fleſhy end. The action of this pair of Muſcles is to draw the firſt Rib upwards and outwards, by which motion the cavity of the Cheſt is widened.

2. Serratum majus Anticum.

The next or *ſecond* pair of the Dilaters is called *Serratum majus Anticum*, or the greater and foremoſt Saw-like pair, ſo called partly from their ſituation and magnitude, and partly from the figure of their Tendons which reſemble the teeth of a Saw. They ariſe from the inſide of the Shoulder-blade and the two upper Ribs, and are inſerted into the lower five True-ribs and two upper baſtard or Short-ribs, before they end into Griſtles; ſo that its breadth takes up a great part of the ſide of the Cheſt, and it is alſo very fleſhy. The *uſe* of this pair of Muſcles is to draw the Ribs outwards and upwards, and ſo to dilate or widen the Cheſt, which it doth more eſpecially in great and violent ſtrainings.

3. Serratum poſticum ſuperius.

The *third proper* pair of the Muſcles of the Cheſt is called the upper backward Saw-pair, or *Serratum poſticum ſuperius*. They are ſeated on the Back under the Muſcle called *Rhomboides* or the fourth Muſcle of the Shoulder-blade, betwixt both the Blades, and above the firſt pair of the

Head. They ſpring membranous from the Spines of the three lower Rack-bones of the Neck and the firſt of the Back, and are inſerted into the Interſtices of three or four of the upper Ribs. Their *uſe* is the ſame as of the former, *viz.* to draw the Ribs upward, whereby the Cheſt is dilated, and the inner Cavity thereof inlarged.

4. Serratum poſticum inferius.

The *fourth* is called *Serratum poſticum inferius*, the lower backward Saw-pair. Theſe are ſeated almoſt in the middle of the Back, under the broad Muſcle that is the firſt of the Depreſſors of the Shoulder. They ariſe from the Spines of the three loweſt *Vertebræ* of the Back and of the firſt of the Loins, with a membranous, nervous and broad beginning; afterwards they paſs with an overthwart line croſs the Muſcles of the Back, and being increaſed with fleſhy Fibres are inſerted into three or four of the lower ſhort Ribs before they turn into Griſtles. Their *uſe* is to draw the three or four loweſt Ribs outwards, and ſo to dilate or widen the lower part of the Cheſt.

Beſides the four pair already named there is yet another Muſcle that aſſiſts theſe in the motion of widening the Cheſt in Inſpiration, which is the *Diaphragma* or Midriff, of which I have already ſpoken in its proper place, namely in the fourth Chapter of the Second Book; I ſhall therefore omit ſpeaking of it any farther here.

Two pair that contract the Breaſt.

Next come we to treat of the Muſcles that *contract* or ſtraiten the Cheſt in Expiration or letting forth the breath. The firſt pair of theſe is

1. Par Triangulare.

called *par Triangulare*, or triangled pair, though they make not a perfect triangle, becauſe they conſiſt of two long ſides and one ſhort one. Theſe ariſe from the middle line of the Breaſt-bone on the inſide of it, (for their ſeat is within the Cavity of the Cheſt, under the Breaſt-bone) being little and ſlender, and are inſerted into the bony ends of the third, fourth, fifth and ſixth True-ribs (where they are faſtned to the Griſtles.) The uſe of this pair is to draw the Ribs toward the Breaſt-bone, and thereby to ſtraiten the Cheſt in Expiration.

2. Sacrolumbum.

The next is called *Sacrolumbum* from their riſe, which is from the *Os ſacrum* and from the Spine or ridge of the *Lumbi* or Loins. They are ſeated under the *Serratum poſticum inferius*, and creeping upwards mix themſelves with the long Muſcle of the Back, and alſo faſten themſelves to the tranſverſe Proceſſes of the Racks of the Loins as far as to the loweſt Rack of the Cheſt, from whence aſcending up to the Ribs, they are inſerted into the lower ſide of them all by a particular Tendon about three or four fingers breadth from the ridge of the Back. The *uſe* of this pair according to *Veſlingius*, is to contract the Cheſt; but *Spigelius* and alſo *Bartholinus* do believe that becauſe it grows out of the ſame beginning with the long Muſcle of the Back, therefore it extends and raiſes up the Cheſt as that doth.

Cervicale deſcendens.

There is another pair oppoſite to this deſcribed by *Diemerbroeck*, a diligent Anatomiſt, who hath given them the name of *Cervicale deſcendens*. Theſe, ſays he, do ſpring from the third, fourth, fifth, ſixth and ſeventh *Vertebræ* of the Neck, and are inſerted into the upper ſide of each Rib, as the *Sacrolumbum* is into the Lower; and ſays, that this pair by pulling the Ribs upwards in Inſpiration widen the Cheſt, as the other by drawing them down in Expiration ſtraiten it.

To the Muſcles already ſpoken of, which do contract the Cheſt, do belong the ſixteen *Internal Intercoſtal* Muſcles: For as the *External* ones aſſiſt the Wideners or Dilaters of the Cheſt in their motions, ſo do the

Internal

Internal alſo aſſiſt theſe contracting Muſcles in the drawing together of the Cheſt, and do all act together as one Muſcle, as the others do; for they paſs obliquely from the lower to the upper Ribs, as the others did from the upper to the lower, their Fibres running contrary to or acroſs the former. All theſe Muſcles are ſaid, ſecondarily, to be aſſiſted in their motion by the Abdominal Muſcles, as alſo by the Muſcles of the Shoulder-blade and Fore-legs.

CHAP. XV.

Of the Muſcles of the Back and Loins.

THE Muſcles of the *Back*, as alſo of the whole Spine, are ſo diverſly and intricately intermixed and knit together, that ſome Anatomiſts have divided them into more, others into fewer, and that by reaſon of the infinite originals of the Fibres and the multitude of their inſertions, all which the admirable wiſedom of Nature thought fit to mingle and knit one within another, that they might the better and with the more ſtrength ſuſtain and accompliſh thoſe ſtrong and violent actions to which they are deſign'd, and alſo with more eaſe and ſafety bear ſuch extraordinary heavy weights, as this noble Animal, the ſubject of my Diſcourſe, doth continually undergo. For if *power united be the ſtronger*, (as the common ſaying is) then certainly if many Muſcles conſpire together unto one motion, they will be better able to perform it.

The Muſcles of the Back have but one motion.

Now that there are not more than one apparent motion performed by the Muſcles of the Back of an Horſe is plain, which motion is by the help of the Back-bones to raiſe up and ſuſpend as it were the whole bulk of the Body, and to bear alſo great weights many times upon it: I ſay this is the main, if not the onely motion performed by theſe Muſcles; for the Bodies of Horſes cannot be turned backwards and forwards, to the ſides, and almoſt ſemicircularly, as the Backs of Men are, as may be ſeen in Dancers, Tumblers and the like.

Again, theſe Muſcles though they are by later Anatomiſts divided into ſeveral pairs, yet the Ancients (as *Galen* for one) were of opinion, that ſeeing they cannot be by any means truly ſeparated, either there muſt be ſo many pair as there are Rack-bones, or elſe (which is more likely) that there is but one onely pair, offering tendinous diſtributions to all the *Vertebræ* of the Back. And ſays *Galen*, If one of this pair work alone, the Spine is inclined towards that ſide, be it the right or left; but if they both work together, the Spine is bended to neither hand, but pulled ſtreight backward, or rather the Spines are held in their ſeveral proper places. And, adds he, whereas almoſt all Muſcles have their Antagoniſts, that are the Authours of a contrary action to theirs, yet theſe Muſcles of the Spine (if you except the bending Muſcles of the Neck) have no Antagoniſts or Oppoſites.

Four pair of the Back and Loins.

Neither are theſe Muſcles of the Back proper to the Back alone, but common to the *Loins* alſo, being reckoned their ſecond pair, of which I

will firſt treat though it be contrary to the cuſtom of Anatomiſts to doe ſo. This pair then goes by the name of *Muſculi longiſſimi*, ſo called from their extraordinary length, as being the longeſt Muſcles (and alſo the ſtrongeſt) in the whole Body: For they ariſe from the *Os ſacrum*, and *Ileum* or Haunch-bone, and paſſing along by the Spine or ridge of the Loins, Back and Neck, they reach as far as to the *Proceſſus Mammillares*, or Mammillary Proceſſes of the Temple-bones. They are almoſt confounded with the *Sacrolumbum* and *Semiſpinatum* in their march through the Loins, whence by ſome thoſe are taken to be parts of this pair: but as ſoon as this pair arrives at the Back, it parts with thoſe, and appears to be diſtinct from them. Their *uſe* is (if they act together) directly to extend the Back and Loins; but if one onely work, then is the Spine inclined on one ſide, for their Fibres are oblique or ſlanting.

1. Muſculi longiſſimi.

2. Par Quadratum. The next pair goes by the name of *Quadratum* or the Square pair, from their Figure; for whilſt they are in their natural ſituation they both of them together make a four-ſquare figure, though when they are ſeparated they are each of a triangular ſhape. They ariſe broad, thick and fleſhy from the backward and upper Cavity of the Haunch-bone, and from the inner and upper ſide of *Os ſacrum*, and remaining fleſhy in their whole courſe, they are inſerted into all the tranſverſe Proceſſes of the *Vertebræ* of the Loins as far as the loweſt Rib. Their *uſe* is to bend the Backs of the Loins with a right motion forward or downward; but if one of them work alone, it draws the Loins to one ſide a little downward.

3. Sacri. The next are the Muſcles called *Sacri*, or holy Muſcles, from their riſe, which is from the *Os ſacrum*. They ſpring with an acute original from that part of the ſaid Bone where the Spine is faſtned to the Haunch-bones. After their original they grow broad by degrees, and though they end not till they come to the Spine of the loweſt *Vertebra* of the *Thorax*, yet in their progreſs they are inſerted into ſeveral of the Spines and oblique Proceſſes of the *Vertebræ* of the Loins, their Fibres running obliquely or with a ſlanting line upwards and inwards. The *uſe* of this pair, if one work alone, is to pull the Body a little on one ſide, but if both act or work together, they extend that part of the Spine to which they are faſtned.

4. Par Semiſpinatum. The laſt pair is called *Semiſpinatum*. Theſe ariſe with a nervous original or beginning from all the Spines or Ridges of the *Os ſacrum* and the Loins, and are inſerted into the tranſverſe Proceſſes of the *Vertebræ* of the Loins and ſome of the lowermoſt of the Cheſt. Theſe with the former pair do fill up the diſtances between the Spines, where they touch one another, nothing coming between them to ſeparate them from one another, but a membranous Ligament iſſuing from the upper Spine. The *uſe* of this pair is to join the Spines together, and to extend or erect that part of the Back to which they grow. Now if all theſe Muſcles of the Back and Loins work together, the whole Back is extended, or in a manner drawn backwards: but if the Muſcles of one ſide work alone, the Body is inclined to that ſide.

The diſtemper called a ſway'd Back is oftner an affection of theſe Muſcles, Theſe Muſcles are apt to have their tone and ſtrength violated by ſeveral accidents, as by over-great Loads, by a ſudden Cold taken by pulling off the Saddle after hard riding before the Horſe be quite cold, and the like; whereby the Muſcles become benumbed and relaxed, and ſo are in a manner deprived of both ſenſe and motion; by which means the

Horſe

Horſe becomes uſeleſs, being ſo far from being able to carry Burthens or to perform any other ſervice for his Maſter, that when he is up he can hardly ſerve himſelf, I mean, ſtand to eat his Meat; or if down, not able to riſe without help. This alſo often happens to old and lean Horſes, in whom by reaſon of the weakneſs of their Bodies, as alſo becauſe they abound with flegmatick Humours, theſe Muſcles are ſo relaxt that they are ſcarce able to ſupport the weight of their own Bodies, much leſs other Burthens. And in this caſe I think nothing more proper than good ſtore of ſtrengthening Food, to ſupport and nouriſh their inſide, whereby they may gain ſtrength, and withall to apply ſome ſtrengthening Plaſter to the outſide at the ſame time.

than any diſlocation in the Vertebræ.

But to recover thoſe that come by this affection by great Colds taken as is above-mentioned, it will be the beſt way to give them warm, ſtrengthening and comfortable Medicines inwardly, and alſo to apply firſt ſome warm Sheep-skins pretty often renewed, and at the ſame time to anoint the Loins with ſome ſovereign Ointments or Oyles outwardly; or if this will not doe, then to ſweat him in a Dunghill, and after he comes out, to apply to the Loins a ſtrengthening Charge or Plaſter.

I thought my ſelf a little obliged in this place to inlarge upon this account, to undeceive many of our Profeſſors, who take all Diſtempers in this kind to be as one, concluding ſtill that all Horſes thus affected, are either ſtrained in the Kidneys or ſwayed, as we call it, in the Back; when indeed theſe Muſcles are either benumbed by cold as aforeſaid, or by ſtrains gotten by carrying over-great weights or burthens, they are diſtended to that degree, that for ſome time they loſe the ſtrength and vigor they uſed to perform their motions with; this, I ſay, is often the true cauſe of the debility and weakneſs of the Back.

Not that I will deny that there is any ſuch malady as a ſwayed Back, for I have my ſelf by diſſection ſeen in a Horſe that was knocked on the Head, (being not curable of this Diſtemper) not onely all the muſcular Parts as it were bruiſed, and many of their interſpaces filled with a kind of a congealed Humour or Matter, but alſo found a kind of diſlocation in that part where the *Os ſacrum* or loweſt *Vertebra* of the Loins are joined, and a deal of congealed Matter ſettled about thoſe Parts. But ſuch a ſtrain is ſeldom curable, or if ever, not without great charge and long keeping. What I have therefore ſaid upon this account is to let our Profeſſors know, that moſt of thoſe affections which they call ſway'd Backs are onely diſtempers of the Muſcles, and therefore eaſily cured if ſoon taken in hand: but thoſe which have broken Backs, (which we commonly underſtand by ſwayed Backs) are ſeldom curable. And thus much ſhall ſuffice as to this ſort of diſcourſe in this place; it remains now that I return to my former diſcourſe, and deſcribe the remaining part of the Muſcles, of which thoſe of the *Anus*, Bladder, and Genitals both in Horſes and Mares come next to be ſpoken to.

CHAP.

CHAP. XVI.

Of the Muſcles of the Fundament, the Bladder, the Teſticles, Yard and Clitoris.

AHorſe being a Creature made for ſervice, it was fit that he ſhould void his Excrements at his own conveniency and choice, and not perpetually; As therefore Nature hath provided Muſcles about the Mouth and Chaps for the receiving, chewing and ſwallowing of the Food, ſo at the end of the Guts and at the outlet of the Urine there are Muſcles ſet as Porters to interclude the paſſage, that nothing might go out but by the Horſe's own accord; whereas were it not for theſe Muſcles, his Excrements would come from him continually and involuntarily, as I have ſeen to happen in ſuch Horſes whoſe Sphincter Muſcle hath by ſome accident or extraordinary weakneſs been violated. Neither hath Nature onely provided Muſcles for the keeping of the Excrements in, I mean till ſuch time as it is neceſſary they ſhould be let forth; but others alſo as inſtruments to aſſiſt in the voiding or letting of them forth. For the former purpoſe is appointed one Muſcle at the *Anus* called the Sphincter, and for the latter, two, called Levators.

The Sphincter *Muſcle of the* Anus.

The *Sphincter* is a fleſhy Muſcle ſeated at the very end of the Arſe-gut, the which it incompaſſeth round like a Ring, to which it may fitly be reſembled. It is rather knit to than ariſes from the lower *Vertebræ* of the *Os ſacrum*, being round and broad, and furniſhed with tranſverſe or overthwart Fibres, or indeed orbicular ones. This Muſcle is much thicker above or inwards, than below or at the Fundament, where it adheres ſo firmly to the Skin, that it is not eaſie to ſeparate it from it. Its *uſe* we have mentioned in the former Paragraph.

Two Levators.

The other two are called the *Levators* or litters up of the Fundament. Theſe are ſmall, broad and nervous, ariſing from the Ligaments of the Hip-bones and *Os ſacrum*, from whence paſſing by the ſides of the ſtreight or Arſe-gut they adhere to it, and are inſerted into the upper part of the Sphincter. A portion of them alſo grows to the root of the Yard, and in Mares to the neck of the Matrix. Their *uſe* is to aſſiſt the Abdominal Muſcles in the expulſion of the Excrements, which they doe by lifting up the Fundament. They alſo help to keep the Fundament from falling out, which ſometimes happens when they are too much relaxt.

The Sphincter *of the Bladder.*

To the *Bladder* doth alſo belong a Muſcle called a *Sphincter*, which is ſeated in the beginning of its neck, the which it compaſſeth round. It is furniſhed with orbicular Fibres as the Sphincter of the Fundament is, and is of the ſame uſe; for it conſtringes or purſes up the neck of the Bladder (as that doth the *Anus*) that the Urine may not paſs out without a ſpontaneous relaxing of this Muſcle. In Mares it is ſeated at the very end of the Bladder, *viz.* at the hole where the neck of the Bladder opens into the *Vagina*.

The Muſcles of the *Yard* are in number four (or two pair) of which we have already treated in the Firſt Book at Chapter 20. of which the firſt pair are called the *Erectores* or Liſters up of the Yard, and the other

Dilatantes,

Dilatantes, Wideners, and by ſome they are called *Acceleratores* or Haſtners. I thought fit in this place onely to name them, referring the Reader to the above-named Chapter for his farther ſatisfaction; as alſo to the ſaid Book at Chap. 22. for the deſcription of the Muſcles of the *Teſticles* called the *Cremaſter* Muſcles, by which the Teſticles are ſuſpended. The Reader may alſo be ſatisfied in the ſame Book at Chap. 27. concerning the Muſcles of the *Clitoris* in Mares, which are two pair, as the Yard of a Horſe, to which it is reſembled, hath; for I ſhall not inſiſt upon *them* in this place neither.

CHAP. XVII.

Of the Muſcles of the Scapula *or Shoulder-blade.*

HAving ſufficiently treated of the Muſcles of the three *Venters*, it remains that I deſcend now to treat of thoſe of the *Limbs*, beginning firſt with the formoſt of them, the firſt of which ſhall be thoſe that move the *Shoulder-blade*.

The *Shoulder-blade* is obſerved to have four motions, *viz.* forward, backward, upward and downward, which motions are performed by four pair of proper Muſcles. The *firſt* pair are ſeated betwixt the two Shoulder-blades, covering the top of the Withers. They are called *Cucullares* from the reſemblance they have with a Monk's Hood or Cowl. Their firſt original is fleſhy and thin, which they take from the *Occiput* or hinder part of the Head; but as they deſcend down the Neck they have other membranous beginnings from five of the Spines thereof, yea and from eight or nine of the uppermoſt of the Cheſt: but they preſently begin to be ſtraitned as they deſcend towards the Shoulder-blades, into whoſe whole ſpine or ridge they are implanted, as likewiſe into the Shoulder-bone and broader part of the Collar-bone. This pair of Muſcles, becauſe of their divers originals, from whence they have ſeveral ſorts of Fibres, are ſaid to perform ſeveral motions; as when the upper part of the Muſcle that ariſes from the *Occiput* is contracted, then is the Shoulder-blade lifted obliquely upward, that part being furniſhed with oblique Fibres; and when that part which ſprings from the Withers is contracted, then it is pull'd ſtreight thitherward.

The Shoulder-blade hath four pair.

1. Cucullares.

The *ſecond* pair are called *Levatores*, the Lifters or Heavers; and by ſome (in Men) *Patientiæ Muſculi*. Theſe are ſituated above the Collar-bone, taking their beginning from the tranſverſe Proceſſes of the firſt, ſecond, third and fourth *Vertebræ* of the Neck; which beginnings being united in the middle (or thereabouts) of the length of the Muſcles, they are at laſt inſerted into the Shoulder-blades at their fore corner. The *uſe* of theſe Muſcles is to draw the Blades upward and forward.

2. Levatores.

The *third* pair is called *Serratum minus Anticum* or the leſſer fore Saw-pair. Theſe lie under the Pectoral Muſcles, and ſpring from the four uppermoſt Ribs before they become griſtly, by four fleſhy portions repreſenting the

3. Serratum minus Anticum.

the teeth of a Saw; from whence they paſs ſomewhat ſlantingly to the Shoulder-blade, into whoſe Proceſs (called its Anchor-like Proceſs) it is inſerted with a broad (partly fleſhy and partly nervous) Tendon. The *uſe* of this pair is to move the Shoulder-blades forward to the Cheſt.

4. Rhomboides. The *fourth* and laſt pair is called *Rhomboides*. Theſe are ſeated under the *Cucullares*, being thin, broad and four-ſquare. They ſpring fleſhy from the hinder Proceſſes or Spines of the three loweſt Rack-bones of the Neck, and as many of the uppermoſt of the Cheſt, and continuing fleſhy to their very inſertion they are implanted into the baſis of the Blades. Their *uſe* is to draw the Blade ſomewhat upward and backward, couching it to the Back.

Note, that ſeeing a Horſe and all four-footed Beaſts go prone, whereas Man walks erect or upright, the motions of the Muſcles might, and ought in ſtrictneſs, to be explained diverſly in *them* from what they are in *him*: As for example, Thoſe which are ſaid in Man to move the Part upward, *viz.* toward the Head, ought in a four-footed Beaſt to be ſaid to move it forward; and thoſe which move it backward in Man, move it upward in the other, becauſe of the different poſture of their Bodies: and the ſame might be ſaid as to their motions forward and backward. But ſeeing many of the Muſcles have their names from their offices in *Men*, it would make but a confuſion and a great impropriety in their appellations to explain their motions by other termes in Brutes. And therefore the Reader is deſired to obſerve, That when we ſay a Part is moved upward, we mean towards the Head; when downward, toward the Tail; when backward, toward the Back; and when forward, we underſtand it toward the Breaſt or Belly.

CHAP. XVIII.

Of the Muſcles of the Shoulder.

THAT which I call the *Shoulder* is that Part or Bone that reaches from the top or pitch of the Shoulder (and is joynted into the Shoulder-blade) to the next Joint which we call the Elbow; which it is neceſſary to intimate for diſtinction ſake, becauſe the Shoulder-blade and this part are commonly both underſtood by the name of the Shoulder. Having advertiſed this, paſs we now to its Muſcles.

Each Shoulder hath nine Muſcles, viz. *firſt, two Erectors.* The motions of the Shoulders are five, *viz.* backwards, forwards, upwards, downwards and circularly. To perform which each hath nine Muſcles, of which there are two that move it upward, namely the *Deltoides* and *Supraſpinatus*; and of theſe we ſhall treat in the firſt place.

Deltoides. The *firſt* is called *Deltoides* from its figure, which reſembles the ſhape of the Greek Letter Δ *delta*. It is fleſhy and (as you may ſee) triangular, ariſing from the midſt of the Clavicle or Collar-bone, the top of the Shoulder, and the whole ridge of the Shoulder-blade, and is extended as far as to the middle of the Shoulder-bone, where it is inſerted. This Muſcle is obſerved to have divers ſorts of Fibres; ſome of which run obliquely

liquely downwards, ſuch are thoſe on the fore-part; others run obliquely forward, which are thoſe on the back-part of it; and a third ſort, which are placed in the middle, run directly toward the Fore-leg: Wherefore (ſays my Authour) when the Fibres of the fore-part are contracted, the Shoulder is lifted upward and forward towards the Horſe's Noſe; if the middle Fibres be contracted, the Shoulder is lifted directly towards his Back; and if the hinder Fibres be contracted, then is the Shoulder carried obliquely backward: ſo that this Muſcle is ſaid not onely to raiſe up the Shoulder (which is indeed its chiefeſt uſe) but helps alſo to perform other motions as well as that.

The *ſecond Erector* or Lifter up of the Shoulder is called *Supraſpinatus* by ſome, but by others *Superſcapularis ſuperior*, or the upper Blade-rider, becauſe it is ſeated uppermoſt upon the Shoulder-blade, and filleth up all that cavity which is between its ſpine and upper edge. It ariſes from the ſpine of the Blade with a long and fleſhy beginning, and paſſing over the jointing of the *Scapula* with the Shoulder-bone by a broad and ſtrong Tendon, is inſerted into the neck of the ſaid Shoulder-bone. This Muſcle is by ſome Authours thought not onely to lift up the Shoulder (which is its principal uſe, as being one of the Erectors) but alſo to help to turn it a little round. Supraſpinatus.

The *Depreſſors* or Pullers down of the Shoulder are alſo two, namely *Latiſſimus* and *Rotundus major*. The *Latiſſimus* is ſo called from its breadth and largeneſs, for with its fellow it covereth almoſt the whole Back. It goeth alſo by the name of *Ani-ſcalptor*, or Scratch-arſe Muſcle (in Men.) It riſes with a membranous and broad beginning from the tops of all the ſpines of the Rack-bones that are betwixt the ſixth *Vertebra* of the Cheſt and the middle of *Os ſacrum*, as alſo from the upper part of *Os ileum* or Haunch-bone: from thence aſcending upward untill it come to that part of the Back where the Ribs begin to bend backward, there it becomes more fleſhy, and is carried over the lower or hinder corner of the Shoulder-blade, at which place it begins to grow narrower but continues fleſhy: and at length by a broad and ſtrong Tendon it is inſerted below the upper head of the Shoulder-bone lengthways, on the inſide, betwixt the Pectoral and Round Muſcles, there being a ſpace left betwixt them for that purpoſe. This draws the Shoulder downward or toward the Tail, though a little obliquely backward. *Secondly*, two Depreſſors. Latiſſimus.

The *ſecond* Puller down of the Shoulder (or its fourth Muſcle) is called *Rotundus major*, or the greater Round Muſcle. It takes its beginning from the whole lower *Coſta* or Rib of the Shoulder-blade, and is inſerted into the upper and inner part of the Shoulder-bone with a ſhort but broad, ſtrong and nervous Tendon. The *uſe* of this is the ſame with the former, *viz.* to pull the Shoulder downward. Rotundus major.

The two pair of Muſcles that pull the Shoulder *forward* are called, the one by the name of *Pectoralis*, and the other *Coracoideus*. The *Pectoralis* is ſo called from its ſituation, which is upon the fore-ſide of the *Breaſt*. It hath a very large and for the greateſt part membranous beginning, which it takes from divers parts: for its upper part ariſes from the middle of the Collar-bone on that ſide next the Breaſt; its middle, from the whole length of the Breaſt-bone and the ends of the Griſtles of the Ribs that end in it; and its lower part ſprings from the Griſtles of the ſixth, ſeventh and eighth Ribs. After it hath taken theſe beginnings, it preſently becomes fleſhy and thick, and running towards the Shoulder is at *Thirdly*, two Pullers forward. Pectoralis.

length inſerted into the Shoulder-bone with a ſhort, but broad, ſinewy and ſtrong Tendon a little below its head, betwixt the Muſcle *Deltoides*, and that which is called *Biceps*. The office of this Muſcle is, when it contracteth it ſelf equally, to move the Shoulder equally and directly forward or toward the Breaſt, inclining to neither hand: but if all its Fibres be not equally contracted, (for by reaſon of its divers beginnings it hath alſo divers ſorts of Fibres, ſome running with a ſlanting line from above downwards, others with the like ſlanting line from below upward, and thoſe betwixt theſe running ſtreight; wherefore I ſay, if all theſe Fibres be not equally contracted, but ſome work, and others not) then are other motions performed by this Muſcle, as the Shoulder drawn more upward or downward, as the different Fibres work.

Coracoideus. *Coracoideus* is by *Bartholin* accounted the ninth Muſcle of the Shoulder (which, ſays he, was firſt obſerved by *Arantius* and *Placentinus*) but we do after the more modern Authours reckon it for the ſixth, and ſecond drawer forward of it. It hath its name *Coracoideus* from its beginning, which is from the *Proceſſus Coracoides* of the *Scapula*; from whence it reaches to the middle of the Shoulder-bone where it terminates. Its *uſe* is (as ſay the diſcoverers of it) to draw the Shoulder to the Proceſs of the Blade-bone, or forward upon the Breaſt.

Fourthly, three Pullers backward. The Shoulder is moved alſo *backward* by three Muſcles, which are *Infraſpinatus*, *Subſcapularis* or *Immerſus*, and *Rotundus minor*.

Infraſpinatus. That which is reckoned the firſt of theſe, is the *Infraſpinatus*, by ſome called *Supraſcapularis inferior*. It is ſeated upon the Shoulder-blade and fills up all that ſpace which is betwixt the ridge or ſpine of the *Scapula* and its lower edge, even as the *Supraſcapularis ſuperior* fills up the upper ſpace. It ariſes fleſhy from the baſis of the Blade below the ridge of it, becoming narrower in its progreſs as the Blade-bone grows narrower, and is inſerted by a broad and ſhort Tendon into the fourth Ligament of the Shoulder-bone.

Subſcapularis. The ſecond Puller or Drawer back of the Shoulder is the *Subſcapularis*, the Under-blade-lurker, or *Immerſus* the drowned Muſcle, becauſe it is ſeated under the Blade-bone betwixt the Ribs and it. Very fleſhy it is, ariſing ſo from the inner part of the baſis of the Blade; in figure it is triangular, like the Bone, growing narrower or ſtraiter by degrees as it deſcends, and is inſerted into one of the Ligaments of the Shoulder.

Rotundus minor. The next being the third and laſt of the Drawers back of the Shoulder is called *Rotundus minor*, the leſſer Round Muſcle, from its figure. It ariſes from the loweſt corner of the *Scapula*, and is implanted into the neck of the Shoulder-bone.

As for the *circular* motion of the Shoulder, *that* is not performed by any one Muſcle, but by ſeveral of theſe already named, acting ſucceſſively one after another.

CHAP.

CHAP. XIX.

Of the Muſcles that move the Fore-leg and Foot.

How far the Fore-leg of an Horſe anſwers in its Parts to the Arm of a Man.

THAT part of the Leg which reaches from the Elbow to that which we call the Knee, anſwers to that part in Humane Bodies which reaches from the Elbow to the Wriſt. Onely in an Horſe there is but one Bone in this ſpace (which we ſhall call the Cubit-bone) whereas in Men there are two going by two diſtinct names, one of which being the greater is called *Cubitus* or the Cubit, and the other *Ulna* or the Ell. But as for that part which we call the Knee, it agrees more exactly with the Wriſt in Men, and might more properly be called ſo: For examining the Part to ſee of what it is compounded, I find it made up of two ranges of little Bones as the Wriſt of a Man is, and not like the Knee of a Man, which conſiſts of one little round Bone (called the Knee-pan) faſtned between the Jointings of the lower head of the Thigh-bone and the heads of the *tibia* and *fibula*: for that Bone is exactly found in the Hind-leg of a Horſe in that Joint we call the Stifle, which is indeed the Knee, as ſhall be proved in a convenient place. And as the Knee of a Horſe is like the Wriſt of a Man, ſo is that Bone below it, (or indeed three Bones, for the Bone which we call the Shank or Shin, hath two ſmall Bones faſtned to it running by its ſides down almoſt all its length till within two or three inches of the great Paſtern; I ſay that as the Knee is that part which is the Wriſt in Man, ſo is this part between the Knee and great Paſtern) anſwerable to the *Metacarpium*, that is, to that ſpace which reaches from the Wriſt to the ſetting on of the Fingers. Onely in Man there are five Bones, and in an Horſe but three. So likewiſe does the great Paſtern correſpond to the firſt Joint of the Finger; the little Paſtern to the ſecond Joint; and the Coffin-joint on which the Hoof grows, to that Joint of the Finger on which the Nail grows.

By this you may ſee that theſe Parts of an Horſe come very near the like Parts of a Man, the number of Bones and Muſcles of the Fingers onely excepted. For a Horſe is *ſolidipes*, or whole-footed, ſo that the whole of it is neceſſarily moved at one time, and therefore has no need of that variety of Muſcles that a Man's Hand is endowed withall. An Horſe's Fore-feet are of no other uſe than to go upon, any more than his Hinder-feet; whereas the Hand of a Man is ordained for other uſes, and is therefore accordingly ſhaped, and divided into more Parts, to wit four Fingers and a Thumb, all which have their peculiar Muſcles to enable them to perform thoſe motions to which they are deſigned. Whence the number of the Muſcles come to differ greatly. Now we ſhall take no notice of thoſe that a Man has more than an Horſe, but ſhall onely treat of thoſe that are to be found to move the Joints of an Horſe already mentioned, *viz.* the Cubit-bone, the Shank, the two Paſterns, and the Coffin-joint.

Two Muſcles bend the Cubit.

First, the *Cubit* is either *bended*, or *extended*. Of the *Benders* there are two; the *firſt* of which is called *Biceps*, from its double beginning; for it hath two heads, the firſt being outward, tendinous and round, ari-

1. Biceps.

ſeth from the upper brim of the hollowneſs of the Shoulder-blade; the ſecond head is broader, and is framed partly of a Tendon and partly of Fleſh: this ariſes from the *Proceſſus Anchoriformis* or Anchor-like Proceſs of the *Scapula*; then deſcending by the inner head of the Shoulder-bone, it meeteth with the former head, and becometh a ſtrong fleſhy Muſcle, running down the inſide of the Cubit-bone to the Knee, where it is inſerted. This bends the Cubit forwards and ſomewhat inwards.

2. Brachiæus internus. The *ſecond Bender* is from its ſituation in Humane Bodies (being placed as the former is, upon the inſide of the Arm in them, and of the Leg in Horſes; I ſay from its ſituation it is) called *Brachiæus Internus.* This lies inwardly under the *Biceps*, and is ſomething ſhorter than it, but of a fleſhy ſubſtance like it. It takes its beginning near the end of that Muſcle of the Shoulder called *Deltoides*, about the middle of the Shoulder-bone, to which it is firmly faſtned: after which it runs its courſe as the former, and is inſerted into the foreſide of the Cubit-bone a little above the Knee, aſſiſting the motion of the former.

Two alſo extend it. There are alſo two Muſcles to *extend* the Cubit, which lie on its outer and hinder ſide. The firſt of them from its length is called *Longus.*

1. Longus. This ariſes with a ſtrong and broad original, partly nervous and partly fleſhy (which ſome make to be two heads) from the lower Rib of the Blade-bone, after which it deſcends on the hinder ſide of the Shoulder-bone, and alſo of the Cubit-bone, and is inſerted into its outſide juſt at the Knee. This draws the Cubit backwards and ſomewhat outwards, and thereby extends it or ſtretches it out ſtreight.

2. Brevis. The *ſecond Extender* of the Cubit is called *Brevis* from its ſhortneſs. It ariſes from the hinder-part of the neck of the Shoulder-bone, and holding the ſame courſe as the former, is inſerted into the lower end of the Cubit-bone at the ſame place with the former, and aſſiſts its motion.

Beſides theſe there are ſaid by ſome Anatomiſts to be two more *Extending* Muſcles, *viz.* one called *Brachiæus Externus* from its being placed on the *outſide* of the Arm in Men. But this is by *Spigelius* looked upon to be the ſecond head of the *Long* Muſcle, becauſe it grows into one Muſcle with it, and has the ſame inſertion with both it and the *Short* one.

The other is called *Anconæus*, being a ſmall-bodied Muſcle, ariſing from the lower and back-part of the Shoulder-bone, and is inſerted into the Cubit an inch or two below the Elbow. But ſome make this to be but a part of the *Short* Muſcle.

As for the other Bone of this Joint in Men, called *Radius*, *that* alſo has its Muſcles, which ſerve to turn the Arm and Hand round: But ſeeing there is no ſuch Bone in an Horſe, as neither any ſuch motion of an Horſe's Leg, it cannot be expected there ſhould be found any Muſcles in *him* anſwerable to the other, as to this part.

Paſs we on therefore to the next Joint commonly called the Shank, but which truly anſwers to the Metacarp, or back of the hand in Men. And this like the Cubit is either *bended* or *extended.*

Two Muſcles bend the Shank. To *bend* it there are two Muſcles; of which the *firſt* is called *Cubitæus internus.*

1. Cubitæus internus. This ariſeth from the inner knob of the Shoulder-bone, and deſcending along the inſide of the Cubit, is implanted into the inner and hinder ſides of the top of the Shank.

2. Radiæus internus. The *ſecond* is called *Radiæus internus* in Men, though very improperly in an Horſe, ſeeing he has no *Radius.* This has the ſame riſe, progreſs and inſertion with the former.

There

TAB XXXIII. p. 182.

There are alſo two Muſcles to *extend* it; the firſt of which is called *Cubitæus externus*. This ſprings from the outer knob of the Shoulder-bone, and deſcending down the Cubit, is inſerted into the outer and fore-ſide of the head of the Shank.

Two alſo extend it.
1. Cubitæus externus.

The *ſecond* of the *Extenders* is called *Radiæus externus* (improperly as to an Horſe, as was noted before.) This has the ſame riſe, progreſs and inſertion with its fellow.

2. Radiæus externus.

The next Joint is the *great Paſtern* which anſwers to the firſt Joint of the Finger in a Man's Hand, as the *little Paſtern* anſwers to the ſecond Joint, and the *Coffin-joint* to the laſt on which the Nail grows. All theſe are either bended or extended as the former Joints were. But before we deſcribe thoſe Muſcles that perform theſe actions, there is one other to be treated of that is called in Man *Palmaris*, from its being ſpread over the Palm of the Hand; but in an Horſe its Tendon is ſpread over the Sole of the Foot, whence the name of *Plantaris* would better agree to it. This ſprings fleſhy from the inner knob of the Shoulder-bone, but preſently grows into a ſlender Tendon which deſcends to the Sole of the Foot as aforeſaid.

The *Paſterns* and *Coffin-joint* are bended by two Muſcles; the *firſt* of which is called *Sublimis*, (I ſuppoſe becauſe it riſes *high* up.) It ſprings from the inner knob of the Shoulder-bone, and is inſerted into the Paſterns.

The Paſterns and Coffin-joint are bended by two Muſcles.
1. Sublimis.

The *ſecond* is named *Profundus*. This ariſes from the upper part of the Cubit-bone, and is inſerted into the Coffin-joint.

2. Profundus.

They are extended by *one* very conſiderable Muſcle, called *Extenſor magnus*. This ſprings from the outer knob of the Shoulder-bone, and its Tendon is inſerted into the fore and outer ſide of the Paſterns and Coffin-joint. Some reckon this to be two Muſcles.

They are extended by one, viz. Extenſor magnus.

There are ſeveral other proper Muſcles that belong to the Fingers in Men, ſome to one and ſome to another, as alſo others that move them laterally, or to and from one another, which it were from our purpoſe here to mention, as not being to be found in an Horſe. Though I dare not affirm poſitively that there are no more than I have here deſcribed; for I am apt to ſuſpect the contrary from the multitude of Tendons that deſcend into the Coffin-joint: however theſe that I have mention'd are the moſt conſiderable and plainly diſcoverable; and rather than encreaſe their number at a *venture*, I will be content that this Chapter be reputed imperfect.

Table XXXIII.

Repreſents an Horſe with the Side towards you, that you may have a ſight of as many of his Muſcles at one view as is poſſible.

AA *Shew the oblique deſcendent Muſcle of the* Abdomen *or Paunch.*
B *The oblique aſcendent Muſcle of the ſame part, at its original from the Hip-bone.*
C *Its membranous Tendon reaching to the White-line.*
D *The tranſverſe Muſcle of the Paunch.*
E *The right or ſtreight Muſcle of the ſame part.*
F *The Pectoral Muſcle.*
G *The* Serratus major Anticus.
H *The* Deltoides *of the Shoulder.*

II *The* Serratus Poſticus.
K *The* Cucullaris.
L *The* Sacrolumbus.
M *The* Longiſſimus Dorſi.
N *The* Semiſpinatus.
OOOOO *The Intercoſtal Muſcles.*
PPP *The Ribs laid bare.*
Q *The end or griſtly part of the Shoulder-blade.*
R Glutæus minor *or leſſer Buttock-muſcle.*
S Glutæus medius *or middle Buttock-muſcle.*
T Glutæus major *or greater Buttock-muſcle.*
V *The* Deltoides *of the Thigh, having its Tendon broken off it.*
XX *The* Muſculus Biceps.
Y *The* Vaſtus Externus.
Z *The* Muſculus Rectus.

a *One of the proper Muſcles of the Cheek called* Lateralis.
b *A Muſcle of the Noſtrils called* Philtrum.
c *The external Adducent Muſcle or cloſing Muſcle of the Noſe.*
d *The* orbicularis *or* conſtringens, *which draws the Lips together, being common to both Lips.*
e *The Muſcles of the Eye-lids.*
f *The Temporal Muſcle.*
g *The* Buccinator *or Trumpeter.*
h *One of the Muſcles of the Neck called* Longus, *ſeated under the Gullet, but to be ſeen in this Figure by reaſon of the poſture of it.*
ii *One of the proper Muſcles of the Head called* Maſtoides.
k *The Muſcle of the Head called* Splenius *or* Triangularis.
l *The Frontal or Fore-head Muſcle.*
m *The* Spinatus, *being one of the Muſcles that move the Neck.*
n *The* Complexus *or* Trigeminus *ſo called from its threefold beginning.*
o *The* Subclavius *pulled a little outward from under the other Muſcles.*
p *The* Infraſpinatus *or* Subſcapularis inferior.
q *The* Supraſpinatus *or* Superſcapularis ſuperior.
r *The* Scalenus.
ſ *The* Rotundus major *or* Humerum deprimens *a little out of its place at its lower end.*
t Muſculus Biceps.
u Longus.
w Brachiæus externus.
x Cubitæus externus.
y Radiæus externus.
z Extenſor magnus.
α Radiæus internus.
β Cubitæus internus.

11 *The* Gaſtrocnemius internus *of both the Hind-legs.*
22 *The* Gaſtrocnemius externus *of the like.*
3 *The Tendon of the Muſcle* Plantaris *coming out as out of a Pully.*
4 *The* Tibiæus Anticus.
55 *The* Extenſor tertii internodii digitorum aut Longus, *ſo called by Mr.* Brown.

CHAP.

CHAP. XX.

Of the Muſcles of the Thigh.

BY the *Thigh* we mean that part which is betwixt the Joint of the *Huckle* or *Whirle*-bone, and that which is called the *Stifle*; which conſiſteth of one large and long Bone, going by the name of the Thigh-bone, or *Femur*. This Bone hath a round head which is jointed into the round Cavity of the Hip-bone, ſo that it admits of all kinds of motions, whence it hath a multitude of Muſcles to perform theſe motions; ſome of which move the Thigh forwards, whereby it is bended; ſome move it backwards, and thereby extend it: a third ſort bend it inward, as when a Horſe rubs the contrary Leg with his Foot, which is often ſeen upon any itching or pricking humour affecting that Part: a fourth ſort move it outwards; and a fifth obliquely about. But firſt of the *Benders forwards*, which are accounted to be three in number.

The Benders of the Thigh are three.

The *firſt* of which is called *Pſoas* or *Lumbaris*. This is almoſt round, thick and livid, and lieth in the inner part of the *Abdomen*, upon the *Vertebræ* of the Loins. It ariſes fleſhy from the tranſverſe Proceſſes of the two loweſt *Vertebræ* of the Cheſt and two or three uppermoſt of the Loins; from whence deſcending by the inſide of *Os ileum*, at length it ends in a ſtrong and round Tendon, which is inſerted on the foreſide of the upper part of the leſſer head of the Thigh-bone. The *uſe* of this is, ſtrongly to draw the Thigh upward, and ſomewhat inward. Upon this Muſcle the Kidneys are placed, near that part of it where its Nerve enters into it; which in Men is the cauſe of that ſtupor or numbneſs that is felt in the Thigh by thoſe that are troubled with the Stone in the Kidneys, on that ſide that the Stone is on.

1. Pſoas.

The *ſecond Bender forward* is called *Iliacus internus*, or the inward Haunch Muſcle. It ſpringeth with a ſlender and fleſhy beginning from the inſide of the Haunch-bone, and being joined by its Tendon to the former Muſcle, is inſerted with a round Tendon into the leſſer head or *Rotator* of the Thigh-bone. The *uſe* of this is the ſame with the firſt, which is, to lift the Thigh up and ſo to bend it forward; yet it doth not move it ſo much inward as the *Pſoas* doth.

2. Iliacus internus.

The *third* is called *Pectineus*, ariſing broad and fleſhy from the line of the Share-bone near its Griſtle, and is implanted into the inſide of the lower end of the Thigh-bone with a broad and large Tendon. Its *uſe* is to draw the Thigh upward and inward. This is the Muſcle that in Men helps to lay one Thigh over the other in ſitting.

3. Pectineus.

Note, that both this laſt foregoing, and all the following Muſcles ſave the two laſt, are inſerted at the lower end of the Thigh-bone, juſt above the Stifle; whereas in Men they are moſt of them if not all inſerted into its upper part, *viz.* either into its neck, or into one or other of the two knobs jetting out at the lower end of the neck, (called the great and little Trochanters.) What may be the reaſon of this different inſertion is not eaſie to gueſs, unleſs it be the ſhortneſs of the Thigh-bone, which in an Horſe is not half ſo long as it is in a tall Man: ſo that an Horſe's Muſ-

cles

cles being ſo plump and bulky upon his Buttocks, it was neceſſary they ſhould have ſome conſiderable ſpace to grow ſlenderer in and to become tendinous; and therefore they are extended as far as the *Stifle* which anſwers to the *Knee* in Man.

The Extenders are alſo three.

Next come we to the Muſcles that bend *back* and ſo *extend* the Thigh, (as when an Horſe ſtretches himſelf) which motion is alſo performed by three Muſcles. The *firſt* of which is called *Glutæus externus*, or the outwardmoſt Buttock Muſcle; in Men it is alſo called *Glutæus major*, the greateſt Buttock Muſcle; but in an Horſe it is not ſo, for in them the middlemoſt is the largeſt. This ſpringeth with a very fleſhy beginning from the Crupper, from the Spine or ridge of the Haunch-bone, and from the *Os ſacrum*. Afterward deſcending a little obliquely and riding over the Joint of the Huckle-bone, it at length grows narrower and more ſlender, and ſo endeth into a ſtrong and broad Tendon, which is inſerted into the inner part of the Thigh-bone juſt above the Stifle, yea it ſeems to reach as far as to the top of the *Tibia*. Its *uſe* is to draw the Thigh backward and ſo to extend it, as alſo to enable the Horſe to go backward.

1. Glutæus major.

2. Glutæus medius.

The next or *ſecond* is called *Glutæus medius*, or the middle Buttock Muſcle. This in Man (becauſe of his going erect) lieth quite under the former, and is ſo hid by it, that unleſs the former be firſt removed, it cannot be ſeen. But in Horſes it is larger than the former, and lieth ſide by ſide with it, as doth the next alſo, and they are both to be ſeen without removing the firſt, as may be plainly obſerved by the following Figure. It ariſes with a fleſhy and broad beginning, a little higher than the firſt, from the Spine of the Haunch-bone on the fore-part of it, and from thence deſcends ſomewhat obliquely over the Joint of the Hip as far as to the lower end of the Thigh-bone, into the outer ſide of which it is inſerted with a broad, ſtrong and membranous Tendon. Its *uſe* is to extend the Thigh and to draw it outward and backward, as when the Horſe ſtands to ſtale.

3. Glutæus minor.

The *third* and laſt of the *Extenders* is called *Glutæus minor*, or leſſer Buttock Muſcle. This in a Horſe ariſes equal in height with the former at the Spine of the Haunch-bone. At its beginning it is round, ſharp and fleſhy; but in its courſe it becomes more broad, deſcending with an oblique line by the ſide of the ſecond Muſcle, and is inſerted at the lower end of the Thigh-bone, rather towards its fore-ſide. This aſſiſts the action of the former, drawing the Thigh outward and backward.

One Mover of the Thigh inward, viz. Triceps or Quadriceps.

The Thigh is drawn to the *inſide* by the Muſcle *Triceps*, or *Quadriceps*, for it goes by both names, becauſe ſome affirm it to have four, and others but three beginnings. This Muſcle is looked upon to be the thickeſt of all the Muſcles of the whole Body, being furniſhed with great variety of Fibres.

The firſt of its beginnings is from the upper part of the Share-bone, where it ariſes with a nervous head, and deſcending is inſerted into the inſide of the lower end of the Thigh-bone.

The ſecond part of it ariſes from the lower ſide of the ſame Bone, being fleſhy and broad, and is inſerted into the inſide of the Thigh-bone, a little higher up than the former.

The third head of this Muſcle ariſes with a fleſhy and ſometimes nervous beginning from the whole lower part of the *Coxendix*, round about the circumference of its wide hole; and is inſerted near the laſt.

The

The fourth head ſprings with a nervous and fleſhy beginning from the tip of the *Coxendix*, and afterward running along the inſide of the Thigh, endeth into a round Tendon, which joining with the Tendon of the firſt part of this Muſcle is inſerted into the lower end of the Thigh-bone with it.

Four Muſcles move the Thigh outward, called Quadrigemini.

The Thigh is alſo turned *outward*, which motion is performed by four ſmall Muſcles called *Quadrigemini*, all which are placed one by another upon the outſide of the articulation of the Thigh. The firſt of them is from its ſituation called *Iliacus externus*, and from its figure, *Pyriformis* or Pear-like Muſcle. This is longer than any of the reſt of them, ariſing round from the lower and outer part of *Os ſacrum*; thence it runneth downward upon the backſide of the great *Rotator*, and is implanted into the outſide of the lower end of the Thigh-bone.

The ſecond and third of theſe Muſcles do want particular names; but both of them ariſe from the knob of *Os iſchium*, near one another, and are inſerted with the firſt.

The fourth and laſt is called *Quadrigeminus quadratus*. It is more fleſhy and broad than the reſt, ariſing from the inner part of the knob of the *Iſchium*, lying ſome two or three inches diſtant from the third, and endeth with the former.

Alſo the Deltoides *of the Thigh.*

To theſe muſt be added that Muſcle which we have named the *Deltoides* of the Thigh, not finding any in Humane Bodies to anſwer to it, ſo as to borrow a name from thence. It ſprings (as you may ſee plain in the foregoing Figure) from the outſide of the tip of the *Ileum*, with a ſharp beginning; but preſently enlarging it ſelf, becomes three-ſquare, and is inſerted with a broad membranous Tendon into the outſide of the Thigh-bone, from which inſertion it appears torn off in the Figure. By its ſituation it ſeems to aſſiſt the action of the *Quadrigemini*.

The Thigh is turned a little about by two Muſcles. viz. 1. Obturator internus.

The Thigh is turned about obliquely by two Muſcles called *Obturatores*, or Stoppers, becauſe they fill up the wide hole between the *Os pubis* and Hip-bone. The firſt is called *Obturator internus*. This ariſeth from the inner circumference of the hole before ſpoken of, and paſſing overthwart the end of the Hip-bone, is inſerted into the Cavity of the great *Rotator*.

2. Obturator externus.

The other is called *Obturator externus*, the outward Filler. This ariſes out of the external circumference of the above-named hole with a fleſhy and broad beginning, and winding about the neck of the Thigh-bone turneth into a ſtrong and large Tendon which is implanted into the Cavity of the great *Rotator* with the former.

And thus much for the Muſcles of the *Thigh*, which for order ſake I have according to the cuſtom of Anatomiſts firſt treated of; but it is neceſſary that we make our diſſection in the Leg firſt, to remove thoſe Muſcles; for we cannot ſo eaſily nor conveniently raiſe nor ſhew theſe of the Thigh, untill thoſe of the Leg be removed, becauſe the heads of ſome of them lie upon the Muſcles of the Thigh.

CHAP. XXI.

Of the Muſcles of the Tibia *or Leg.*

THE Muſcles of the *Tibia* or Leg are of the ſame number in Horſes as in Men, (like as the Muſcles of moſt other Parts are) the inſertion of ſome of them onely excepted. Which difference ſprings from hence, that this Bone of the Leg which in a Horſe is but one main Bone ſupported on each ſide with another ſlender immoveable one for ſtrength, as alſo for the ſafer paſſage of the Tendons of the Muſcles between them, (which I ſuppoſe to be the onely uſe of them, as not being moveable; I ſay this Bone which in a Horſe is but one) is in a Man two, going by two different names, *viz.* the one by that of *Tibia*, and the other, by that of *Fibula*, and ſome of the Tendons of the Muſcles are inſerted into one of them, and ſome into the other. But otherwiſe ſo far as I have had opportunity to examine them, I have found them to have the ſame original, ſubſtance, figure and courſe in a Horſe as in Man; and therefore I ſhall proceed to treat of them after the ſame method as I have done of all the reſt, forbearing to ſpeak any further of the difference (in a Man and an Horſe) between the Parts that are moved by the Muſcles to be treated of in this and the following Chapter, untill I come to the Book of the Bones, where I ſhall ſhew at large the ſimilitude between them, and that the difference is not ſo much as it may be believed to be.

The Leg is extended by five Muſcles.

The *Leg* hath three motions allowed it, *viz.* bended, extended, and moved obliquely outwards. All the *Extenders* are placed on the fore-part of the Thigh, of which the firſt is called *Membranoſus*. This Muſcle is by *Bartholin* called the *Abductor*, as if its uſe were to move the Leg obliquely outwards; but that office is by other Anatomiſts ſince him aſcribed to the *Poplitæus*, and this ſaid to extend the Leg. It ariſeth fleſhy from the upper part of *Os ileum* on the outſide, and near the great Proceſs of the Thigh-bone it becomes broad and nervouſly membranous, wherefore it is called *Faſcia lata*, the broad Swadling-band, for it enwrappeth almoſt all the Muſcles of the Thigh within it ſelf; and being come as low as the Knee in Humane Bodies, and that Joint we call the Stifle in Horſes, (which exactly anſwers to the other, even as far as to the little round Bone between the two Bones of the *Femur* and *Tibia*, called the *Patella* or Knee-pan) I ſay when it is come as low as the Stifle (over which it croſſes) it is at laſt inſerted into the *fore-ſide* of the *Tibia* or Bone of the Leg. Its *uſe* is, as hath been ſaid, to extend the Leg directly; or as ſome Authours will have it, ſomewhat to abduce it or draw it obliquely outwards.

1. Membranoſus.

2. Longus.

The *ſecond Extender* is called *Longus*, and *Sartorius* or *Sutorius*, from its uſe in thoſe Men that ſit croſs-legg'd at work, as *Shoomakers* and *Tailors*. It ariſes ſharp and nervous from the upper and fore-part of the appendix of *Os ileum*, and as it paſſes obliquely down the inſide of the Thigh, it becomes more fleſhy and broad, continuing ſo till it come to the inſide of the Leg a little below the Stifle, where it ends in a broad Tendon, and is inſerted into the Bone of the Leg or *Tibia*. The *uſe* of this Muſcle

Muſcle is not onely to extend the Leg, but alſo to draw it inwards; wherefore it is by ſome Authours reckoned for one of the *Benders* of the Leg.

The *third*, from its *ſtreight* courſe, is called *Rectus*, the Streight Muſcle. This takes its beginning from the lower brim of the Haunch-bone, and paſſing with a fleſhy and round belly ſtreight down the fore-ſide of the Thigh untill it come to the Stifle, it there turns into a ſtrong and broad Tendon, which adhering to the *Patella* deſcends over it, and is implanted into the fore-ſide of the upper part of the Shank. 3. Rectus.

The *fourth* is called *Vaſtus externus*, becauſe of its *great* fleſhy *bulk*, and becauſe it deſcends on the *outſide* of the Streight Muſcle. It ariſes broad and nervous from the root of the great *Rotator* or *Trochanter*; cleaving cloſe to the outward part of the Thigh-bone all along its courſe, untill it come to the Stifle, where it becomes membranous and broad, and uniting with the Tendon of the Streight Muſcle or *Rectus*, is inſerted into the ſame place with it, but on its outſide. 4. Vaſtus externus.

The *fifth* is called *Vaſtus internus*, running on the *inſide* of the *Rectus*. It ariſes from the root of the leſſer *Trochanter* and from the neck of the Thigh-bone with a nervous beginning, and afterwards growing fleſhy deſcends down the Thigh-bone, ſticking cloſe to it, till it come to the Stifle, over which it paſſeth, and afterward unites its ſelf with the former two, and takes its inſertion in the ſame place of the *Tibia* as they do. 5. Vaſtus internus.

It is worth the Diſſectour's taking notice of theſe three laſt Muſcles, how they be joined all in one juſt at their croſſing the Stifle, where they make one broad and very ſtrong Tendon, which ſpreads over and involves the *Patella* or little Bone of the Stifle, and ties it ſo faſt in its place upon the jointing of the Thigh-bone with the *Tibia*, that it is very ſeldom diſplaced, or indeed never. For although by diſtentions or ſtrains we often have this Part affected; yet never did I ſee an abſolute diſlocation in it. The *Patella* indeed may be (and often is) wrenched either to one ſide or the other as the accident may happen, but it is immediately reduced to its place again by this compound ligamentous Tendon, which like a *Spring* retracts it ſelf into its former Station, and the Bone to which it is knit, alſo. So that, that malady which is commonly taken for a diſlocation of this Bone, ſeems rather to be from Bloud extravaſated out of the Capillary Veſſels, which by great diſtentions many times may be broken; which Bloud lieth congealing and putrifying in the ſpaces between the Membranes and Muſcles, affecting the ſenſible neighbouring Parts, which puts the Horſe to that great pain we obſerve him to have on ſuch accidents. Now the means we uſe to remove this pain is by chafing the Part with penetrating Oils, which commonly effect the cure, if they be uſed preſently before the Bloud be too much congealed: But if the pain be not removed by this means, we are fain to open the Skin by way of an Iſſue, blowing in wind to ſeparate the ſeveral Skins one from another, and ſo make way for the congealed Matter the better to come forth; which done, the pain is removed, and the affection quite taken away, and the Horſe moſt times goes again as well as ever. Whereas ſhould this Bone be diſplac'd, as it is by many Farriers thought to be, this way of proceeding ſeems ſo far from contributing to the cure, that by laying the Skins open there is rather given more liberty for the Bone to remove out of its place, than any aſſiſtance afforded toward the reſtoring it again. But

ſo much by way of digreſſion to inform our Profeſſours in this point; I ſhall now proceed to deſcribe the remaining Muſcles, the next of which are the *Benders* of the Leg.

Four Muſcles bend the Leg.

1. Biceps. Theſe are in number four; the firſt of which (according to *Bartholin*) is called *Biceps*, though by other Authours it is reckoned the laſt and fifth, ſuppoſing that there are five of theſe Muſcles. It ariſes ſharp and nervous from the appendix of the *Coxendix*, and being carried on the outſide of the Thigh, it doth about its middle become fleſhy, as if it begun there with a ſecond head; from whence deſcending it groweth in its courſe more thick and outwardly nervous, untill it becomes a ſtrong Tendon, which is inſerted into the outer ſide, (but ſomewhat backward) of the appendix of the *Tibia*. The *uſe* of this Muſcle is to bend the Leg by pulling it backward.

2. Semimembranoſus. The *next*, according to the before-named *Bartholin*, is the *Semimembranoſus*, which by others is reputed the fourth Bender. It takes its beginning from the knob of the *Coxendix* as the former doth, with a ſmall, membranous head, from whence it runneth down the back-part of the Thigh, till it come to the Leg-bone, into which it is inſerted with a round Tendon behind, in that place which in Man is called the Ham.

3. Seminervoſus. The *third* (according to the ſame Authour) is the *Seminervoſus*, ſo called from its ſubſtance, it being partly nervous and partly fleſhy, as the former was partly fleſhy and partly membranous. This ariſes ſmall and nervous from the ſame knob of the *Coxendix* as the former two did; from whence deſcending obliquely by the back and inner part of the Thigh (in which courſe it becomes fleſhy) its Tendon reaches towards the middle of the Leg-bone, into whoſe inner and backer part it is inſerted.

4. Gracilis. The *fourth* is called *Gracilis*, the ſlender Muſcle. This by ſome Authours is accounted for the *ſecond* Bender of the Leg, but I ſhall after the method of the before-named Authour rank it for the fourth and laſt. It ariſes with a large and nervous beginning from the middle of the Share-bone juſt at its jointing, from whence it runs down the inſide of the Thigh untill it comes to the *Tibia* or Leg-bone, into whoſe inſide it is inſerted with a round Tendon near the former.

Note, that ſome of theſe Muſcles being placed more outward and others more inward; if they all work together, they draw the Leg directly backward; but if one be contracted alone, then it doth bend the Leg a little either to this or that ſide, according as the Muſcle is placed, as well as draw it backward.

One moves it obliquely, viz. Poplitæus. There is another Muſcle whoſe uſe is to move the Leg *obliquely*; its name is *Poplitæus*. It takes its riſe broad and nervous from the outer head of the Thigh-bone, and afterward becoming fleſhy runs with a ſlanting line down the Thigh to the back and inward part of the upper knob of the *Tibia*, where it is inſerted.

CHAP.

CHAP. XXII.

Of the Muſcles that move the lower part of the Leg, and the Foot.

BY the *lower part* of the Leg is to be underſtood that Bone which is below the Hock or Hough, reaching from thence to the great Paſtern; which Bone anſwers to thoſe five in Humane Bodies that make the Inſtep. Likewiſe the great Paſtern and little Paſtern anſwer to the firſt and ſecond Joints of the Toes in Men; and laſtly that which is called the Coffin-joint on which the Hoof grows, is anſwerable to the laſt joint of the Toes on which the Nails are placed. Onely the difference is, that a Man becauſe of his going upright, treadeth upon the whole ſpace from the Heel to the Toes; and his Foot is alſo divided into five Toes, each conſiſting of ſeveral Joints, that by ſpreading themſelves and graſping cloſely on what he treads upon, they may keep him the more firmly erect. Whereas a Horſe and other four-footed Beaſts having four Feet upon the ground, have no need of ſo broad nor large a Foot, and do therefore go as it were upon Tip-toes, their Heels reaching as high up the Leg as to the Hock, which indeed is the Heel of the Horſe, as a very eminent and learned Phyſician who did me the honour to take a view of my Skeleton, intimated to me. For make but any Quadruped, as a Dog or the like, ſtand upright, lifting up his Fore-feet, and you may obſerve all that part of his *Leg* from the Hough downwards to lie upon the ground as a Man's Foot does; yea ſome, as Coneys, *&c.* in their ordinary gate tread upon all that ſpace: onely ſuch Creatures have their Feet cleft into Toes, whereas a Horſe is whole-footed, and thence ariſes a difference as to the number of the Muſcles of the Foot.

Note, that the Muſcles which move each Bone have onely their *Inſertions* into that Bone they are to move, and that they take their *riſe* from the Bone or ſome other Part (immediately or mediately) above it, as may be obſerved by the foregoing diſcourſe of the Muſcles of the Thigh and Leg. Thus thoſe Muſcles that move the Thigh, take their original from either the Hip-bone, Share-bone, or *Os ſacrum*, all of which are above it; likewiſe thoſe that move the Leg, ariſe from the Hip or Share-bones, or elſe from the Head or ſome other part of the Thigh-bone which is the Joint above it; and thus laſtly do the Muſcles that are to move all that part of the Leg or Foot which is below the Hock, ſpring from and lie upon the Parts above the Hock, ſave the *Flexor brevis* and *Tenſor brevis*, and the *Plantaris* which is at the Sole of the Foot (which cannot properly be called a Muſcle neither, for it is very little or not at all carnous, but rather ligamentous) for otherwiſe onely the Tendons of the Muſcles reach hither, and are inſerted ſome into one Joint, ſome into another.

The Inſtep-bone is bended by two Muſcles.

The *Foot* is bended, extended, and moved (a little) to either ſide, according to the motion of the *Inſtep-bone* (for ſo we ſhall call it for diſtinctions ſake.) Firſt, it is *bended* when it is drawn upwards and forward. To perform which motion there are two Muſcles aſſiſting: the firſt of which is called *Tibiæus anticus* or the forward Leg-muſcle, ſo named

1. Tibiæus anticus.

named from the ſituation of it, which is upon the fore-part of the Leg-bone towards its outer ſide. It ariſes ſharp and fleſhy from the upper appendix of the Leg-bone, cleaving cloſe to it all along as it deſcends, and towards the bottom of it, it turneth by degrees to a Tendon, which paſſing under the Griſtle that compaſſeth about the next Joint or Hock, is divided into two or more Tendons that are inſerted into the foreſide of the Inſtep-bone, which (together with the reſt of the Foot) it moves forward and upward.

2. Peronæus anticus. The next is called *Peronæus anticus*, becauſe it ariſes in Man from that Bone of the Leg that is called *Perone* or *Fibula*, and therefore it is improperly ſo called in an Horſe that wants that Bone, and in whom it ſprings from the upper appendix of the *Tibia*, and deſcending downwards with a fleſhy body till it come almoſt to the bottom of this Bone, it turneth into a Tendon as the former did, which Tendon paſſeth down by the outſide of the Hock, and is inſerted into the outſide of the Inſtep-bone, which with the reſt of the Foot it moves forward and ſomewhat outward.

It is extended by three. The Foot is alſo *Extended*, that is, when the Inſtep-bone is drawn backwards, which motion is performed by three Muſcles: of which the

1. Gaſtrocnemius externus. firſt is called *Gemellus externus*, or *Gaſtrocnemius externus*. This in Men makes the greateſt part of the Calf of the Leg. It takes its riſe broad and fleſhy from the inner head of the Thigh-bone at the lower end of it, and alſo from the outward head of the ſame Bone, for it hath a double beginning; which two heads deſcending for a while apart, they begin to be united into one about the middle of the Leg-bone, after which they both turn into one entire, broad, ſtrong and nervous Tendon, which unites with the Tendon of the following Muſcle called *Gaſtrocnemius internus*, and both are inſerted into the Heel-bone.

2. Gaſtrocnemius internus. The *ſecond Extender* of the Foot is called *Gaſtrocnemius internus*. This Muſcle lyeth ſomething under the former, ariſing from the hinder-part of the upper end of the Leg-bone with a ſtrong, nervous beginning, and growing tendinous toward the lower end of the Bone unites with the Tendon of the foregoing, and is inſerted into the Heel-bone with it as aforeſaid.

3. Plantaris. The *third* and laſt is called *Plantaris*, or the Muſcle of the Soal or Tread. This ariſes fleſhy, round and ſlender between the former two, taking its beginning from the back-part of the lower head of the Thigh-bone. After it hath deſcended a little way down the Leg-bone it becomes a ſlender round Tendon, which running between the Tendons of the former two and joining very cloſely with them deſcends down to the Heel-bone, where it leaves them and proceeds along the back-part of the Inſtep-bone and the two Paſterns, and terminates within the Foot, ſpreading all about the bottom of it, making that Part which is called the Soal of the Foot in Men, and in Horſes that Part that lieth next under the Soal, and is plain to be ſeen when we have drawn the Soal of the Foot out.

The Tendons of theſe three Muſcles make the magna Chorda. It is the Tendons of theſe three Muſcles that make that ſtrong and thick Tendon by which Butchers hang up their Meat, which by reaſon of its greatneſs and ſingular ſtrength is called *Chorda magna*. It is alſo this Tendon running down the back-part of the Leg, which we call the back Sinew, which being affected either by a ſtrain or bruiſe or other accident, cauſes ſo great a pain, by reaſon of the ſenſibleneſs of the Tendon. When it is hurt, the Horſe many times falls exceeding lame, though ſuch acci-

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accidents are not ſo dangerous to life in Horſes as they are ſaid to be in Men; for we make no difficulty in curing them, eſpecially if preſently taken in hand, but Chirurgeons do moſt times conclude Wounds of this Part in Men to be very dangerous by reaſon of their frequent falling into convulſions thereupon.

It is moved ſideways by two.

The Foot is alſo moved ſomewhat ſideways, *viz.* inward and outward, by two Muſcles. The *firſt* of which is called *Tibialis poſticus.* This ſpringeth from the upper end of the Leg-bone, from whence it deſcends among the before-named hinder Muſcles till it come to the Inſtep-joint, where it becomes tendinous, and from thence runs down the inner ſide of the Inſtep-bone and Paſterns, till it come to the Soal of the Foot, into which it is inſerted. Its *uſe* is to move the Foot obliquely inward.

1. Tibialis poſticus.

2. Peronæus poſticus.

The *ſecond* is called *Peronæus poſticus* (improperly in an Horſe.) It ariſes from the upper and hinder-part of the Leg-bone by a nervous and ſtrong beginning, from whence it deſcends all along the outſide of the Bone cleaving firmly to it, untill it reach its middle, where it becomes tendinous, and deſcends with the Tendon of the *Peronæus anticus* on the outſide of the Inſtep-joint or Hock, but is not joined with it; for it continues its courſe further untill it reach the Foot, into the bottom of which it is implanted. This moves the Foot contrary to the former, *viz.* obliquely outward.

The Paſterns and Coffin-joint are bended by two Muſcles.

The Paſterns and Coffin-joint are likewiſe *bended*, or *extended* by their proper Muſcles. The *Benders* are two, of which the *firſt* is called *Flexor longus*, or the Long Bender. This ariſes from the upper and hinder-part of the Leg-bone, about the middle whereof it becometh tendinous, and deſcends on the inner ſide of the Hough down the Inſtep-bone and Paſterns into the Coffin-joint.

1. Flexor longus.

2. Flexor brevis.

The *ſecond* is called *Flexor brevis*, the Short Bender. It ſprings from the inſide of the Heel-bone a little below the Hock, and has the ſame inſertion with the former. Theſe bend the Paſterns and Coffin-joint by drawing them backward.

They are extended alſo by two.

The *Extenders* are alſo two. The *firſt* is called *Longus Tenſor*, or the Long Extender. It ariſes from the fore and inner ſide of the Shank juſt under the Stifle, and deſcends on the fore-ſide of that Bone, the Inſtep-bone and the Paſterns, and is inſerted into the fore and upper part of the Coffin-joint.

1. Extenſor longus.

2. Extenſor brevis.

The *ſecond* ariſeth from the fore-part of the annular Ligament that binds about the Inſtep-joint, and deſcending under the former has the ſame inſertion. Theſe two extend the Paſterns and Coffin-joint by drawing them forward.

Thus I am come to the end of the Treatiſe of the Muſcles, in deſcribing of any of which if I have erred, I hope the Apology with which I prefaced this fourth Book will obtain my excuſe with all ingenuous Men: and as for the moroſe and carping, I ſhall take it as a favour from them, if inſtead of railing at random, they will take the pains to demonſtrate my miſtakes.

Table XXXIV.

Repreſents an Horſe with his hinder-part toward you, that the Muſcles of his Buttocks, *&c.* may be the plainer ſeen.

AA *Shew the* Cucullaris *or Monk's Hood.*
B *The edge of the* Deltoides *of the Thigh.*

C *The*

C *The* Glutæus minor *or leſſer Buttock Muſcle.*
DDD *The* Glutæus medius *or middle Buttock Muſcle.*
EE *The* Glutæus major *or greater Buttock Muſcle.*
F *The* Biceps.
GG *The* Seminervoſus *of both Legs.*
HHH *The* Lividus *or* Pectinalis *of both Hind-legs.*
I *The* Semimembranoſus.
K *The* Orbicularis *or orbicular Muſcle of the Lips.*
L *A portion of the* Longiſſimus dorſi.
M *The circular Muſcle of the Noſe.*
N *The ſphincter Muſcle of the Fundament.*
O *The* Maſtoides *on the other ſide the Neck.*
P *The* Muſculus lateralis *or* Manſorius, *being one of the Muſcles of the Cheeks.*
Q *The* Muſculus ſcalenus *or* Triangularis.
R *The* Complexus *or* Trigeminus.
S *The* Tranſverſalis Colli *or tranſverſe Muſcle of the Neck.*
T *The* Spinatus Colli *being one of the Extenders of the Neck.*
V Vaſtus externus.
WW Gaſtrocnemius externus.
X Peronæus anticus.
Y Peronæus poſticus.

The End of the Fourth Book.

THE

THE ANATOMY OF AN HORSE.

BOOK V.

Of the Bones.

CHAP. I.

Of the nature, definition, differences and parts of Bones.

THE *Bones* are by a learned and ancient Philoſopher compared to the Carkaſe of a Ship, to which the reſt of the Parts are faſtned and whereupon they are ſuſtained. Theſe afford ſtability, ſtreightneſs and form to each Part and to the whole. The knowledge of them is moſt neceſſary; for without it we muſt needs be ignorant of the originals and inſertions of the Muſcles; and upon fractures or diſlocations of them, it were very unlikely that any ſhould ſet them right again without the knowledge of their ſhapes, and the manner of their jointing one with another.

A *Bone* is ſaid to be a *ſimilar Part, the drieſt and coldeſt of all the reſt, made of the moſt earthy and tartareous part of the Seed in the Womb,* (*i. e.* of the Humour in the *Ovum* or Conception) and is nouriſhed with the like particles of Bloud after the birth, and moiſtned with the Marrow contained in it. *The definition of a Bone.*

The material and efficient cauſes of a Bone.

In which deſcription the word [*Seed*] is to be interpreted as we have intimated, and not of the Male and Female's Seed mixed together in the Womb, as the Ancients conceived; for it is certain that the Female hath no true Seed, and that the Male's being onely an active principle of generation, affords nothing of matter to the Parts of the *Fætus*, but onely impregnates the *Ovum*, as ſhall be ſhewed more at large when I come to ſpeak to the *Generation of Animals*. Thus the Male's Seed is no material cauſe at all of the Bones, but onely a *remote* efficient cauſe of them as it is of other Parts of the Body; of all which the plaſtick or formative power that is ſeated in the *Ovum* it ſelf, is the *immediate* efficient.

Their differences.

As to the *differences* of Bones, they are many, as being divided or diſtinguiſhed ſeveral ways. And firſt from their hardneſs, or ſoftneſs: thus the lower parts of the Temple-bones are called *Petroſa*, ſtony Bones, and ſuch are alſo the Bones of the Teeth. Others are in reſpect to theſe, ſoft; ſuch are the ſpongy Bones of the Noſe, and thoſe which are called *appendices* to any Bone. And laſtly of a mean ſubſtance between theſe may be reckoned all the reſt of the Bones.

They are again divided or diſtinguiſhed by their magnitude; thus ſome are eſteemed great, ſome little, and ſome of a moderate ſize betwixt both.

Alſo they are divided by their figure; ſome being plain, ſome round; ſome have three ſides, others four; ſome are like a Boat, ſome a Cup; ſome like a Hammer, an Anvil, or a Stirrop, ſuch are the Auditory Bones.

They are alſo diſtinguiſhed from their ſituation, connexion, cavity, ſenſe, and upon ſeveral other conſiderations, which it would be tedious further to proſecute.

Their Parts.

Again, the Bones are many of them divided into three *parts*; firſt, that part whereof the body of the Bone conſiſteth; ſecondly, the part that groweth to the Bone; thirdly, the bunching part of the Bone: of which the firſt hath no proper name belonging to it, but is called by the name of the whole Bone; the ſecond being that part that groweth to the Bone is properly called *Epiphyſis*, the Appendage; and that part that bunches out beyond the plain ſurface, is called *Apophyſis*, or the Proceſs.

How many Bones of the Head.

In relation to this diſcourſe of the Bones we ſhall divide the Body into three Parts, *viz.* the Head, the Trunk and the Limbs. By the *Head* is implied both Head and Neck. The firſt and uppermoſt Part of the Head is the Skull, called *Cranium*, becauſe it is as it were *Cranos* an Helmet to the Brain. It is compounded of ſeveral Bones to the number of fifteen or ſeventeen in Humane Bodies, ſay moſt Anatomiſts, that is, in all, as well little as big; for of the large ones there are but nine, three of which are common to the Skull with the upper Jaw-bone, which are the Wedge-like Bone or *cuneiforme*, the Yoke-bone, and *ſpongioſum*, the ſpongy or Sieve-like Bone. The other ſix are proper Bones and make up the Skull it ſelf; and thoſe are the Fore-head Bone, the Noll-bone, the two Bones of the *Synciput*, and the two Temple-bones, in which laſt are contained (in each of them) three ſmall Bones, of which we have already treated where we ſpoke of the Parts of the Ear in the third Book at Chap. 14. namely the Hammer, the Anvil and the Stirrup, all which make up the ſaid number of fifteen Bones of the Skull; to which if we add the lately found-out Bone of the Ear, called the orbicular Bone, there will be ſeventeen. Now the larger Bones are divided or diſtinguiſhed by

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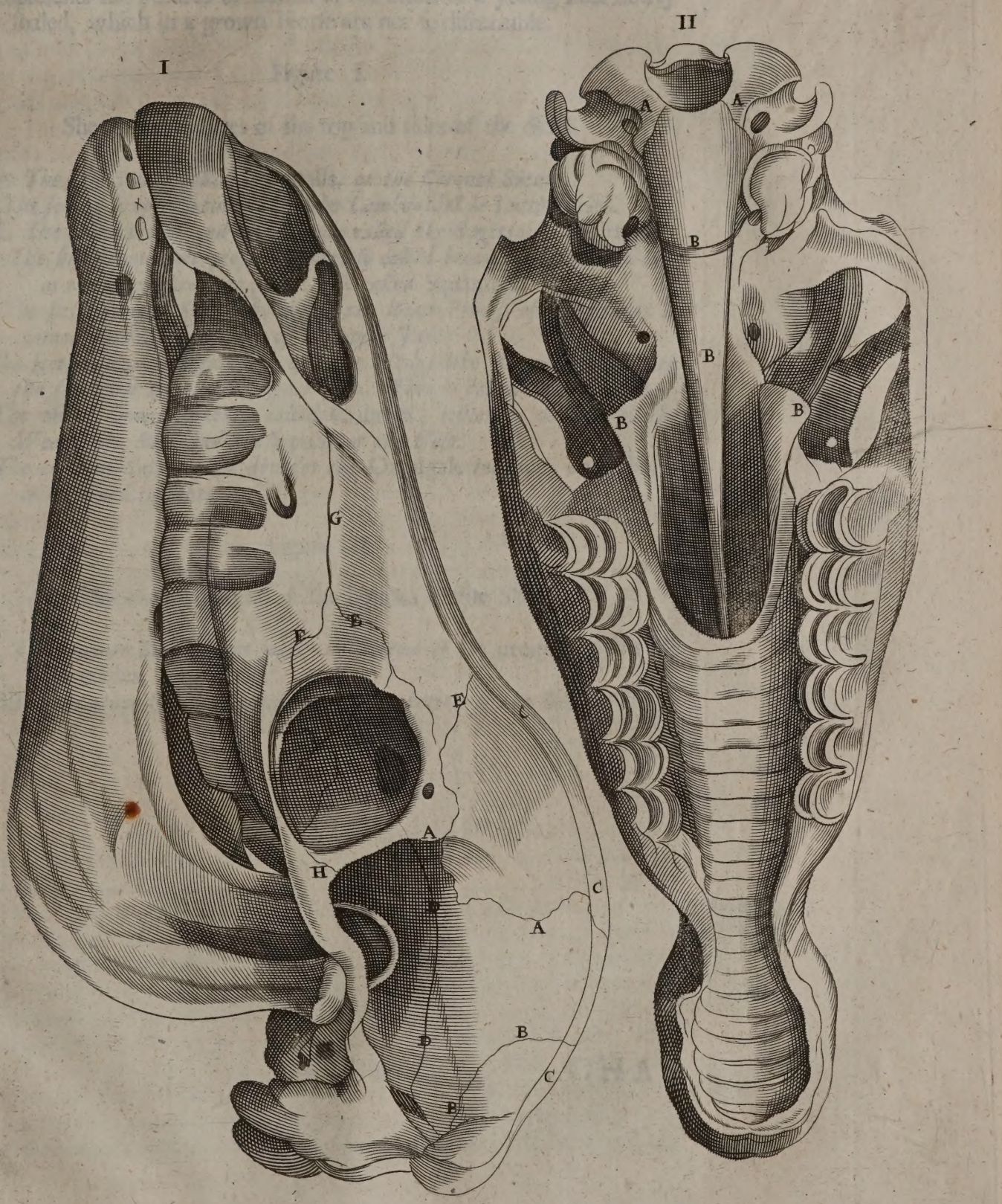
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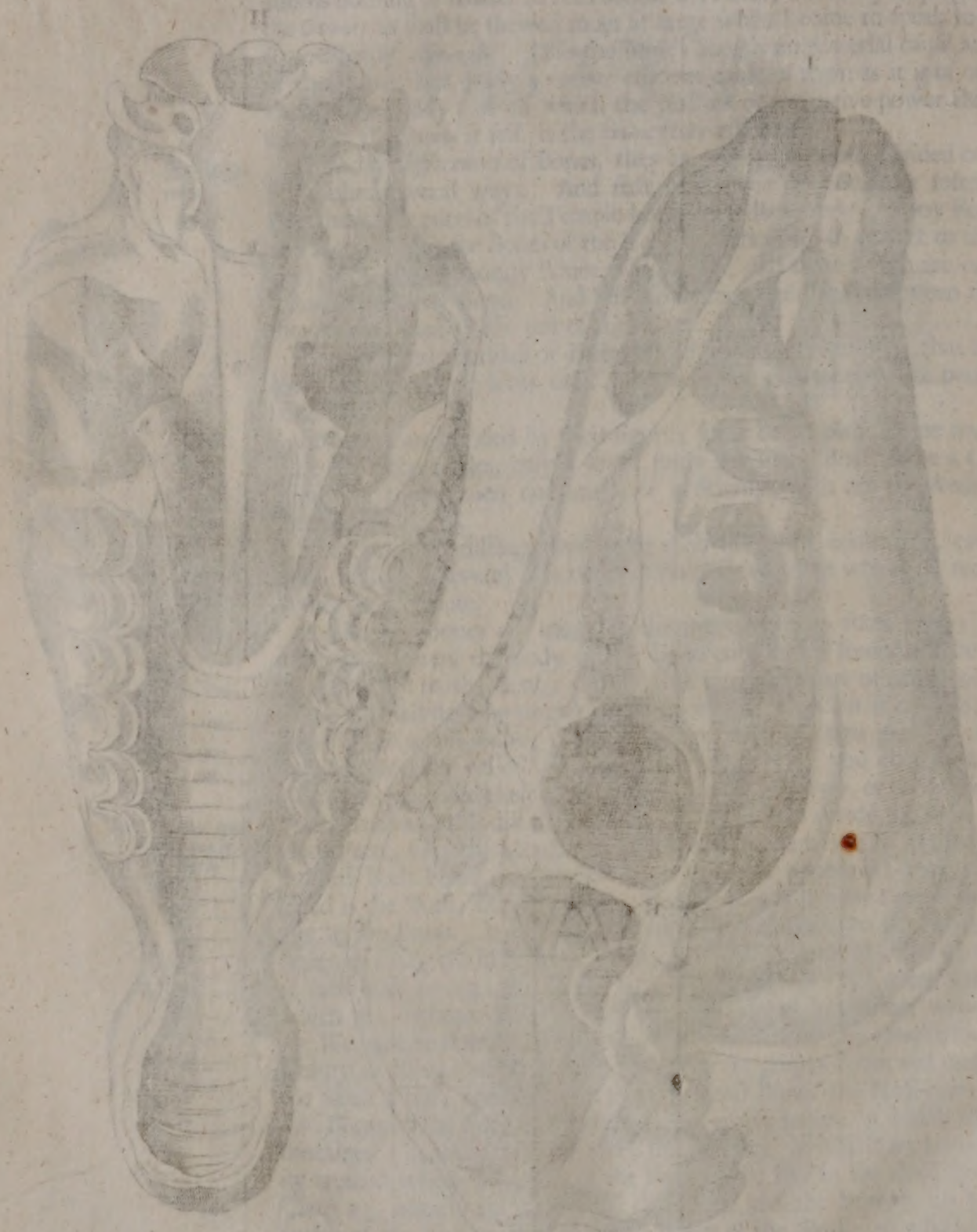


ſeveral Seams called Sutures, and both Bones and Sutures are of the ſame number in this Animal we are treating of as in Men, as may be ſeen by the following Figure.

Table XXXV.

Repreſents the Sutures or Seams of the Skull of a young Foal newly foaled, which in a grown Horſe are not ſo diſcernible.

Figure I.

Shews the Sutures of the top and ſides of the Skull.

AAA *The firſt Suture called* Coronalis, *or the Coronal Suture.*
BB *The ſecond proper Suture called the Lambdoidal or* Lambdoides.
CCC *The third proper and true Suture called the Sagittal or* Sagittalis.
DD *The firſt counterfeit proper Suture, ſo called becauſe it is not Saw-like as the other three are; it is alſo called* Squamoſa.
EE *The firſt common Suture by which the lower Proceſs of* Os frontis *is joined with the firſt Bone of the upper Jaw.*
F *The ſecond common Suture by which the Wedge-like Bone is joined with the ſaid firſt Bone of the upper Jaw. This is called* Cuneiformis.
G *The third common Suture called* Cribroſa, *which is common to the Wedge-like Bone and the* ſeptum *of the Noſe.*
H *The common Suture that divides the* Os jugale *into two, or by which it is joined together.*

Figure II.

Shews the Sutures of the bottom of the Skull.

AA *The common Suture that joins the bottom of* Os occipitis *to the* Os ſphenoides.
BBBB *Some other Sutures that belong to the bottom of the Skull.*

CHAP. II.

Of the Sutures or Seams of the Head.

A Suture what, and of how many kinds.

A *Suture* is the connexion of one Bone of the Head to another, of which there are two ſorts: the one is plain and linear, like two boards glewed or ſtones cemented together; the other indented like the teeth of two Saws put tooth within tooth.

The Sutures are proper or common. The proper are true or falſe.

Of theſe Sutures ſome are *proper* to the Skull alone, and ſome are *common* to it with the upper Jaw. The *proper* Sutures are again double, that is to ſay, *true* or *falſe*. Of the former ſort are thoſe Saw-like ones before-named, which are three in number, *viz.* Coronal, Lambdoidal and Sagittal; and of the latter are the plain ones, which ſome reckon to be more, ſome fewer.

True Sutures are
1. The Coronal.

The *firſt* of the Saw-like ones is called in Humane Skulls *Coronalis* or the Crown-Suture, becauſe the Ancients were wont to wear their Crowns or Garlands in that place. This Suture, as in Men, ſo likewiſe in a Horſe runs overthwart the Skull above the Fore-head, reaching from the Temple-bone of one ſide to the Temple-bone on the other, joining the *Os frontis* or Fore-head-bone to the *Synciput* or Bone of the fore-part of the Head.

2. The Lambdoidal.

The *ſecond* is called *Lambdoides* or Lambdoidal Suture, as reſembling in its dimenſion the Greek letter Λ *lambda*. This is ſeated on the back-part of the Head, being oppoſite to the former, beginning at the bottom of the *Occiput*, from whence it aſcends obliquely to either Ear in Men, but in a Horſe ſomething above the Ear, running with a more ſlanting line. It joins the Bone of the *Occiput* to the Bones of the *Synciput* and Temples.

3. The Sagittal.

The *third* runs not overthwart the Head as the two former, but lengthways of it, reaching in Humane Skulls from the top or middle of the Lambdoidal to the middle of the Coronal Suture onely; but in Horſes it reaches further (as it does in Children) croſſing the Coronal Suture, and runs afterward down the Fore-head-bone to the Noſe. This is not ſo Saw-like in Horſes Skulls as the other two are, as may be ſeen by the foregoing Figure. It is the laſt of the true or Saw-like Sutures, and hath the name of Sagittal, from its ſtreightneſs, its courſe being ſtreight like an *Arrow*.

The falſe Sutures are two.

Next come we to the *falſe*, counterfeit or baſtard proper Sutures, which are thoſe that reſemble a Line onely, and are not Saw-like at all. Theſe are in number two; the firſt of which paſſeth from the Root of the *Proceſſus mammillaris* upwards with a circular Duct, and paſſeth downwards again towards the bottom of the Ear, after it hath compaſſed in the Temple-bone. By this Seam are the Bones of the *Synciput*, *Occiput* and *Sphenoides* joined with the Temple-bones.

The ſecond of the baſtard proper Sutures runs obliquely downwards, ariſing from the ſide or rather top of the former, and runs down toward the Socket of the Eye, to the beginning of the firſt common Suture.

The

The *common* Sutures are thoſe that belong not to the Skull alone, but are common to it with the Wedge-like Bone and the upper Jaw. Of which theſe that follow are the moſt remarkable. *The common Sutures are*

Firſt, the *Frontalis*, by which the outer Proceſs of the Fore-head-bone is joined with the firſt Bone of the upper Jaw. 1. Frontalis.

The *ſecond* is that which is called *Cuneiformis* or Wedge-like, by which the Wedge-like-bone is joined with the firſt Bone of the upper Jaw. 2. Cuneiformis.

The *third* is called *Cribroſa*, which is common to the Wedge-like-bone, and the *ſeptum* or partition of the Noſe. 3. Cribroſa.

Now the *uſes* of theſe Sutures or Seams are, firſt, to be vents of the Brain, through which the impure and ſooty excrements might exhale or evaporate; ſecondly, to help to ſtay the Brain from tottering, and its parts from being miſplaced in violent motions, by giving way to the Fibres that paſs through them from the *Dura mater* within, to the *Pericranium* without the Skull, by which Fibres the ſaid *dura mater* and alſo the Brain it ſelf (which is wrapt within it) is kept ſuſpended as it were, that ſo the hardneſs of the Skull might not offend it by preſſing againſt it, nor the Brains own weight bear too hard upon the bottom of the Skull, which it would be apt to do were it not for its being thus born up or ſuſpended by theſe Fibres that tie the *Dura mater* to the outſide of the Skull. *The uſe of the Sutures.*

Theſe Sutures were alſo made for the ingreſs and egreſs of the Veſſels, for the life and nouriſhment of the Parts contained within the Skull.

Laſtly, that if at any time the Head ſhould happen to be broken, the fracture might not run through the whole Skull, but ſtay at the end of the fractured Bone; whereas were it not for theſe Seams, it would like an earthen Pot with one knock or fall be in danger of being ſhivered all in pieces, which it is not now ſo apt to do, for the crack will not ſo eaſily paſs over a Seam as it would run along an intire bone.

CHAP. III.

Of the proper Bones of the Skull.

THE Bones of the Skull are of two ſorts, *proper* and *common*. Of the firſt in this Chapter; and of the latter in the next. *The Bones of the Skull are proper or common.*

The *proper* are in number ſix; one of the Fore-head, another of the hinder-part of the Head or *Occiput*, two of the Crown, and two of the Temples, all which are divided or diſtinguiſhed from one another by the before-named Sutures. *The proper are ſix.*

The Fore-head-bone, called *Os frontis*, is ſeated before, and maketh the fore-part of the Skull, both above and a little below the Orbit of the Eyes. It is bounded before by the Coronal and firſt common Suture, on the ſides by the Temporal Bones, and on the inſide by the ſpongy Bones. 1. *The Fore-head-bone.*

Betwixt

Its Cavities. Betwixt the *Laminæ* or Scales of this Bone at the top of the Noſe there is a large (or rather double) *Cavity*, from whence two holes paſs to the Noſtrils, diſtinguiſhed by many bony Fibres and ſmall Scales, which are encompaſſed with a green Membrane, and contain a ſoft medullar, or as it were an oylie body.

The *uſes* aſcribed to theſe Cavities are various: as firſt, to prepare the air that is drawn in by the Noſtrils, for the generation of animal Spirits; ſecondly, to keep for ſome time the odoriferous air whereby ſmells may be more leiſurably perceived; thirdly, ſome think that they ſerve for the collection of flegmatick Excrements; and others, laſtly, that they aſſiſt or promote the ſhrilneſs or echo of the Voice. I will not determine of the truth of any of theſe opinions; but ſhall onely obſerve this further, that theſe Cavities are much larger in an Horſe than they are in a Man, even the difference of the bulk of their Bodies conſidered.

Beſides theſe Cavities there is alſo a Den or *Sinus* made of a double Scale; one of which being outermoſt maketh the upper (inward) part of the Orbit of the Eye, and is plain; the other maketh the Cavity above the Eyes on either ſide, and is not plain, but hath inſcriptions anſwerable to the winding convolutions of the Brain, whoſe bunching-out portions it receives.

Its Holes. This Fore-head-bone hath alſo two *Holes* in the middle part of the Eye-brow, which go to the Orbit of the Eye, by which the firſt branch of the Nerve of the fifth conjugation of the Brain goeth to the Muſcle of the Fore-head.

Its Proceſſes. It hath alſo four *Proceſſes*, two of which are ſeated at the greater corner of the Eye, and other two at its leſſer, all helping to make the upper part of the Orbit.

The Bones of the Synciput. *Their connexion.* Next come we to the Bones of the *Synciput* or fore-part of the Head, which are in number two, being joined before with the Bone of the Fore-head by the Coronal Suture, with the *Os occipitis* behind, by the Lamb-doidal Suture, on each ſide to the Temple-bones by the ſcaly Sutures, and to the Wedge-like-bone by one of the common Sutures. They are alſo joyned together, or one to another, in the middle or top of the Head (lengthways) by a Suture common to them both, called the Sagittal Suture.

Their ſhape, ſubſtance, ſurface and holes. Their *figure* is almoſt four-ſquare; their *ſubſtance* thinner than that of the other Bones, yet conſiſt of two plates, ſave in their lower edges, where they are joined to the Temple-bones. On the outſide they are ſmooth, but on the inſide uneven, having ſeveral ſhallow Cavities or Dens by the ſides of the Sagittal Suture, to which the *Dura mater* firmly grows; as alſo many long and winding inſcriptions or furrows for the Veſſels which run from the internal Jugulars through the ſaid *Dura mater* to the Brain. They have likewiſe ſeveral perforations or little *holes*, ſome of which indeed penetrate but one Plate, which are for the entrance and exit of the Veſſels that run between the Plates; but moſt run quite through them, and are made for ſmall Veins and Arteries to paſs both from within outwards, and from without inwards.

The Os occipitis. Next is the *Os occipitis*, or Noll-bone, which makes the hinder and lower part of the Head, and the middle part alſo of the baſis of the Skull. It is of a very hard ſubſtance, harder than any Bone of the Skull beſides, (except the *Os petroſum* of the Temple-bones) being thicker at the bottom where it is without fleſh, and where the two *Sinus* of the *Dura*

mater

mater are joined. At the ſides of the great perforation (through which the Spinal Marrow deſcends) it is ſomewhat thin and without any Cavities or ſmall Dens in it; but that its thinneſs here might be no prejudice to it, from the edge of this perforation there aſcends on the inſide a large Proceſs or Prominence running along to its top, to ſtrengthen it and arm it againſt any accidents that might happen by blows, &c. This Prominence it is that diſtinguiſhes the two Protuberances of the *Cerebellum*.

Its ſhape and connexion.

This Bone is in ſhape five-corner'd, by two of which corners it is joined in its upper part to the Bones of the *Synciput* by the Lambdoidal Suture; by two other in its fore-ſides to the Temple-bones by one of the counterfeit Sutures; and by its fifth corner to the *Os cuneiforme*, or Wedge-like Bone.

Its Sinus.

It hath in it ſeveral *Sinus's* or Chanels, of which ſome are on the inſide, and others on the outſide of it. Of thoſe on the *inſide* there are two which are pretty large, ordained for the receiving the protuberances or bunchings out of the *Cerebellum* or After-brain. The others on the inſide are ſome to receive the protuberances of the Brain it ſelf; others to receive the two *Sinus's* of the *Dura mater*, that they might not be compreſſed by the Bones of the Skull; and the reſt are for the like uſes. The two that are on the *outſide* of this Bone, are in its lower part by the ſides of the great perforation, of a ſemicircular ſhape.

Its Proceſſes and Holes.

This Bone hath alſo ſeveral *Proceſſes*, four of which being clad with a glib Griſtle are received into ſo many *Sinus's* of the firſt *Vertebra* of the Neck. But that is the moſt conſiderable which I mentioned before, and ſerves to ſtrengthen the Bone. It has *Holes* to the number of five; the firſt is in the midſt of the bottom of the Noll, which is the largeſt of all the inward holes of the Head, being in ſhape round and ſomewhat long, through which the *Medulla oblongata* or Spinal Marrow paſſeth out of the Skull into the Cavity of the *Vertebræ* of the Neck. The other four are leſs by far, and are made for the tranſition of ſeveral Veſſels.

The Temple-bones. Their connexion.

The *Temple-bones* come next to be treated of, which are ſeated on the ſides of the Skull and reach to the bottom of the Ears. They are joyned on their upper part to the outſide of the Bones of the Crown by the Suture called *Squamoſa*, or Scale-like. In their fore-part they are joined to the firſt Bone of the upper Jaw, by its firſt Proceſs; and their hinder-part is joined to the *Os occipitis*, by one of the counterfeit Sutures.

Their figure.

The *figure* of the Temple-bone is in its upper part ample, equal and ſemicircular; but below, it is very ſhapeleſs, like to a rude, rugged and unequal Rock, from whence as alſo from its hardneſs it hath its name of *Petroſum*, or the Rocky-bone.

Their ſubſtance.

The *ſubſtance* of this Bone is alſo full of variety; for at its bottom it is thick and rugged; but as it aſcends, by degrees it grows much thinner, and at its top is ſo thin that it is almoſt tranſparent, (eſpecially where it gives way to the Temporal Muſcle) and like a Scale lies upon the lower edge of the Bone of the *Synciput*, which Bone in its deſcent under the Temple-bone is alſo attenuated.

Their Sinus.

The Temple-bones have each of them two *Sinus* or Cavities. The *outer* of theſe is much larger than the other, being lined with a Cartilage or Griſtle, ſeated betwixt the Auditory paſſage and the Proceſs of the Yoke-bone. It is of an indifferent length, running as it were tranſverſly or overthwart, and has the longer Proceſs or the head of the lower Jaw inſerted or articulated into it. The other Cavity is *inward* at the back-

ſide

ſide of the Proceſs of the Yoke-bone, and is common to the Temple-bone with the Noll-bone.

By theſe *Sinus* or Cavities there ſtands a ſharp and longiſh, and (in Horſes) pretty thick (but in Men far more long and ſlender) Appendix, from its ſhape in Humane Bodies called *Os ſtyloides*, the Pen-like Bone. Beſides which there are alſo three *Proceſſes*; two of which are external, and one internal.

Their Proceſſes.

The *firſt external* is blunt, thick and ſhort, (ſaid to be ſomewhat hollow within) tending downwards, in ſhape ſomething like to the Nipple of a Cow, from whence it is called *Mammillaris*.

The *ſecond* of the *outward* Proceſſes runs forward from the hole of the Ear to the Proceſs of the firſt Bone of the upper Jaw, both of them framing the *Os jugale*, or Yoke-bone. For theſe two Proceſſes, one of the Temple-bone and the other of the firſt Bone of the upper Jaw, being joined by an oblong Suture do make the faſhion (as it were) of a Bridge, or of an Oxes Yoke, from whence that Bone hath its name, and of which we ſhall treat further in the next Chapter.

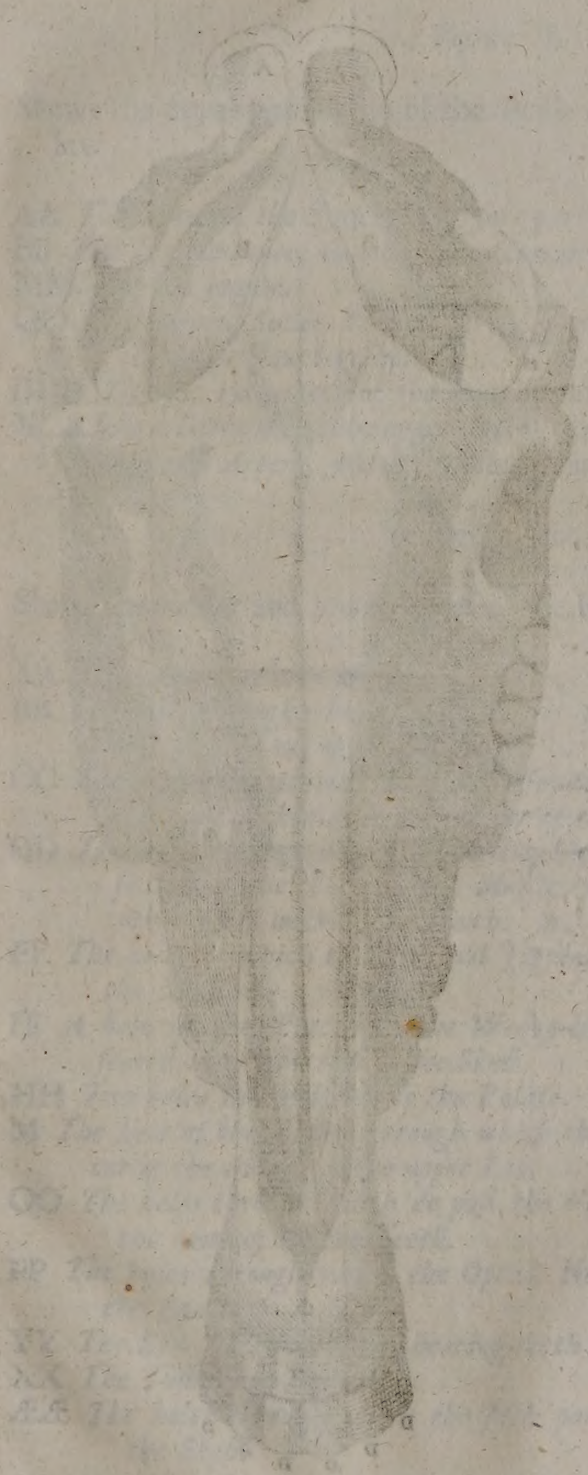
Os petroſum.

The *third* Proceſs, which is *internal*, is that which is called the Rocky-bone. It is pretty long, jetting out to the inſide of the bottom of the Skull, within which it hath two *holes*, through one of which an Artery, and through the other the Auditory Nerve paſs to the inner *Cavities* of the Ear, which are three in number, namely the *Tympanum* or Drum, the *Labyrinthus* or Labyrinth, and the *Cochlea*, or Snail-ſhell. On the outſide of the Skull this Proceſs has three perforations or holes. The firſt and largeſt of which is called *meatus Auditorius*, or the hole of hearing. The ſecond is narrow, ſhort and oblique, near to the firſt, by the firſt hole of the Wedge-like Bone. Through this the Jugular Vein enters into the inner Cavities of the Skull. The third hole is ſeated betwixt the *Proceſſus mammillaris* and the *Styloides* or Pen-like *Appendix*, ending into that paſſage that goes from the Ear to the Mouth. As to the little Bones that lie hid in the Cavities of this Proceſs, by ancient Anatomiſts they were reckoned to be but three, but there is by modern Authours added a fourth; and they are commonly known by theſe following names, *viz. Incus*, *Malleus*, *Stapes*, and *Os orbiculare*, of all which I have already treated in the fourteenth Chapter of the Third Book, where they are alſo lively repreſented in Figures, to which place I refer the Reader for his further ſatisfaction; having not mentioned them in this place, but that they make up the number of the *proper* Bones of the Skull.

Its Holes, and Cavities.

Table

I



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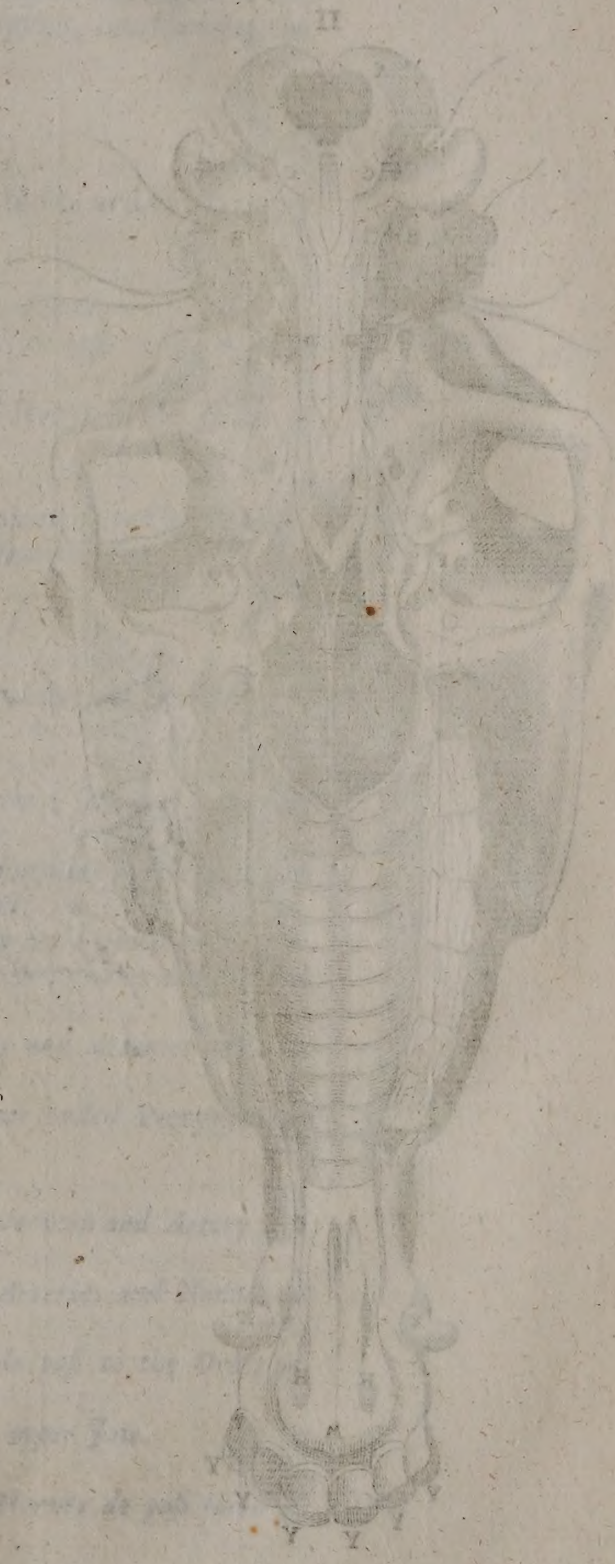

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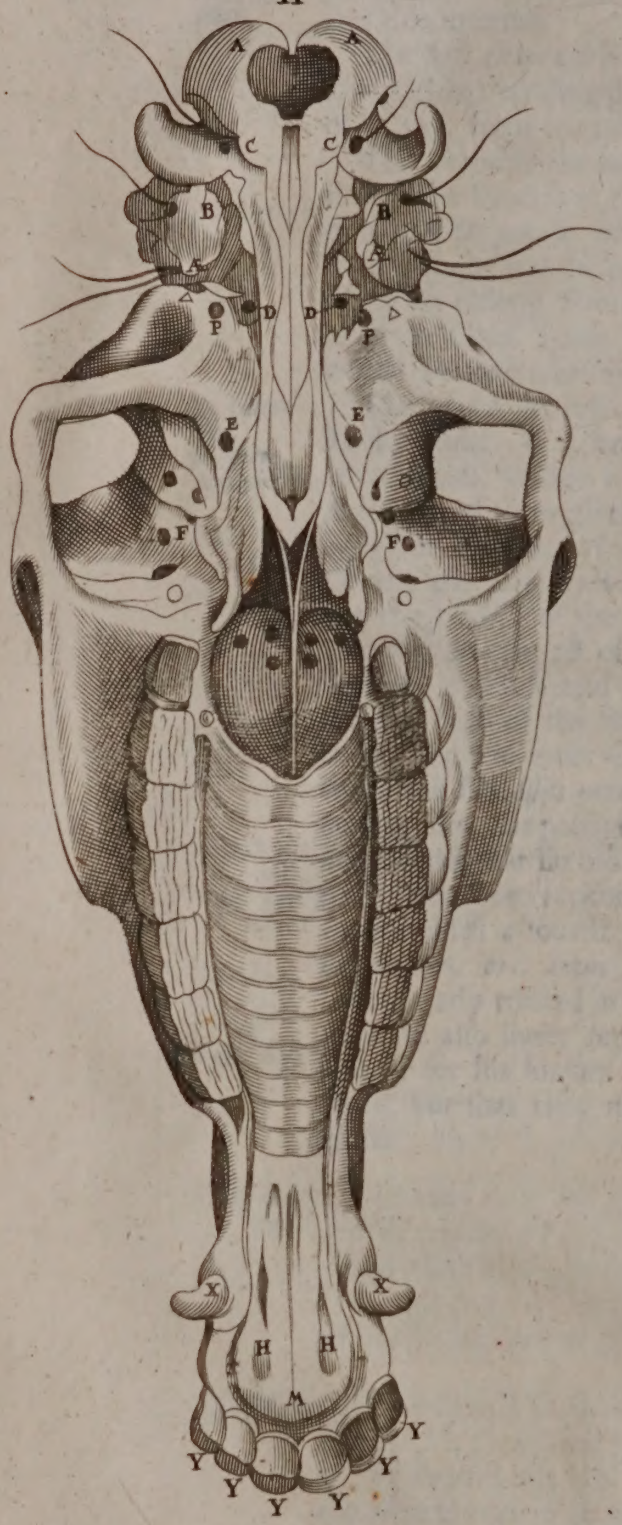

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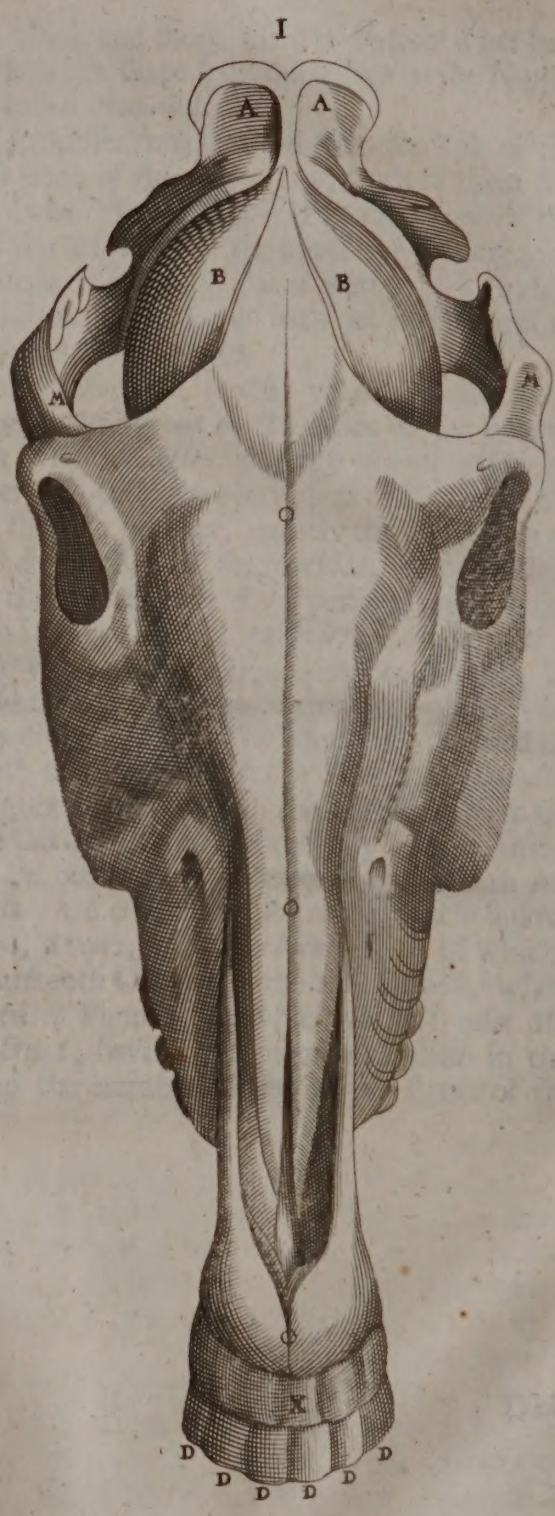


Table XXXVI.

Shews the ſeveral Bones of the Skull both proper and common, together with the ſeveral perforations for the outgate and ingate of the Veſſels, as many as can be ſhewed in two Figures, one ſhewing the top and the other the bottom of the Skull.

Figure I.

Shews the uppermoſt Bones of the Skull, of the Noſe, and of the upper Jaw.

AA *The Bones of the* Synciput *or fore-part of the Head.*
BB *The Temple-bones, on which the Temporal Muſcles reſt.*
MM *The* Os jugale.
OO *The common Suture that joins the Fore-head-bone and the Bones of the upper Jaw together.*
DDD *The ſix Fore-teeth of the upper Jaw.*
X *A hole a little above the upper Gumm, through which do paſs the Palate-vein and Artery, which branch afterward about the upper Lip.*

Figure II.

Shews the hinder and lower Bones of the Head, with their perforations.

AA *The* Os occipitis *or Noll-bone.*
BB *The holes through which the ſixth pair of Nerves (formerly ſo reckoned) do paſs out of the Skull.*
CC *The two holes through which the ſeventh conjugation of Nerves (of the ſame reckoning) do paſs out of the Skull.*
DD *The holes through which the taſting Nerves do paſs, which are diſperſed about the Tongue, the Muſcles of the* Os hyoides *and ſeveral other parts within the Mouth.*
EE *The holes by which the external Jugular Veins and Arteries paſs into the Skull.*
FF *A hole in the Proceſs of the Wedge-like Bone called* Pterygoides, *ſeated at the bottom of the Skull.*
HH *Two holes in the Bones of the Palate.*
M *The hole of the Palate through which the Palate-vein and Artery paſs out of the Mouth to the upper Lip.*
OO *The holes through which do paſs the Veins, Arteries and Nerves to the roots of all the Teeth.*
PP *The holes through which the Optick Nerves do paſs to the Orbit of the Eyes.*
YY *The Six Fore-teeth or Shearing-teeth of the upper Jaw.*
XX *The Tuſhes, or Dog-teeth.*
ÆÆ *The holes through which the fifth pair of Nerves do paſs forth of the Skull.*

CHAP. IV.

Of the Bones common to the Skull and upper Jaw.

HAving hitherto treated of the Bones *proper* to the Skull onely, I come now to treat of thoſe which are *common* to it with the upper Jaw; and theſe are in number three, namely, the *Os ſphenoides* or *cuneiforme*, the *Os cribriforme*, and the *Os jugale*.

The Wedge-like Bone. Its ſituation. The firſt of theſe is the *Sphenoides*, or Wedge-like Bone, ſo called from its ſituation, which is betwixt the Bones of the Skull and the upper Jaw, and not from the likeneſs of its figure to that of a Wedge, as ſome do believe. It is joined before to the Fore-head-bone, and behind to the *Os occipitis*. At the ſides it doth a good part of it join to the *Os petroſum*. Above, it is joined to the firſt, fourth and ſixth Bones of the upper Jaw; and below, to the Bones of the Palate of the Mouth.

Its Proceſſes. It hath ſeveral *Proceſſes*, of which ſome are external, and ſome internal. The *internal* are four, ſtanding out like four feet of a Table or Chair, which (taking in the ſpace between them) form the *Sella Turcica*. The *external* are alſo four, of which the two *formoſt* are contiguous to the upper Jaw, and are called the Wing-like Proceſſes, from the reſemblance they have to Bats-wings; for they are thick in ſome places, and yet end into a notable thinneſs, almoſt as thin and ſharp as the edge of a Knife. The two *hinder* are ſtretched out toward the *Styloides* Proceſſes of the Temple-bones.

Its Cavities. This Bone hath ſeveral *Cavities* or hollowneſſes; two of which are common with it and the Temple-bones, and the Bones of the *Synciput*.

Its Holes. It hath alſo many perforations or little *Holes* to the number of ſeven on each ſide. One of which being round gives a paſſage to the Optick Nerve toward the Eye. The reſt are penetrated ſome by one, ſome by ſeveral pairs of Nerves; others by the Carotid Arteries and Jugular Veins; and others again by both Nerves and Bloud-veſſels.

The Sieve-like Bone. Its ſituation and connexion. The next common Bone of the Head and upper Jaw is the *Os cribriforme*, ſo called from the ſeveral or indeed innumerable little holes in it, which make it like a *Sieve*, through which holes the ſmells do paſs to the Mammillary Proceſſes, or Olfactory Nerves. It is ſituated in the fore-part of the Skull, between or a little below the Sockets of the Eyes, under the middle baſis of the Fore-head-bone, and at the upper part of the Noſtrils. It is joined by a plain or ſimple line to the Fore-head-bone, the ſecond Bone of the upper Jaw, and to the *Os cuneiforme*.

Its Parts. This Bone is by ſome divided into *four parts*; of which the *firſt* is a Proceſs in the upper and middle part of it, which is long and triangular, ending in a ſharp point, whence it is called *Criſta galli*, or the Cock's Comb. This runs in betwixt the Mammillary Proceſſes dividing them one from the other. To its ſharp point the *Sinus* of the *Falx* adhereth.

The *ſecond* part of this Bone is that which moſt properly is called *Os cribriforme*, being perforated all over like a Sieve, ſome of which holes are ſtreight and ſome oblique. They are obſerved to be much larger in Dogs

Dogs than in any other Animal (allowing for the proportion of their Bodies) which is ſuppoſed the reaſon why their ſmell is more exquiſite than that of any other Creature.

The *third* part is a Proceſs in its lower or under ſide oppoſite to the upper Proceſs; which part divideth the upper part of the Noſe into two Noſtrils, whence it is called *ſeptum Naſi*, the Partition-bone of the Noſe.

The *fourth* and laſt part of this Bone is compared to a Sponge or Pumice-ſtone, being porous and full of ſmall cavities, which are filled with a ſpongie fleſh; and from this part the whole Bone is by ſome called *Os ſpongioſum*. For the names of *cribriforme* and *ſpongioſum* are confounded one with the other, being either of them given indifferently to the whole Bone. But if we will conſider the *ſpongioſum* onely as a part of the *cribriforme*, then we muſt ſay, that it is that part of it that is ſeated juſt at the top of the Noſtrils. Some make two Bones of it, affixing one at the top of each Noſtril, and call them in the plural number *Oſſa ſpongioſa*.

The *uſe* aſcribed to the *Os cribriforme* by moſt Anatomiſts hath been to diſcharge through its pores or holes flegmatick excrements from the Brain into the Noſe, but he that ſhall examine them, will find that its holes are ſo filled either with the ſpongie fleſh before-named, or elſe with the Fibres of the ſmelling Nerves paſſing through them to the inſide of the Noſtrils, that there is no paſſage left for any humour by them. What we therefore account their true uſe to be, the Reader may be informed, if he pleaſe to turn back to the fifteenth Chapter of the Third Book, where we treated of the Noſe, and deſcribed its uſes: adding to what is there ſaid of it, that it makes up the inner corner of the Orbit of the Eye. *Its Uſe.*

The *third* and laſt Bone common to the Skull and upper Jaw is called *Os jugale*, or the Yoke-bone. This is ſeated on each ſide of the Horſe's Face between the *meatus* of the Ear or Auditory paſſage, and the firſt Bone of the upper Jaw; being framed of two Bones, one of which is a Proceſs of the Temple-bone that is carried from the *meatus Auditorius*, and is the hinder of them; and the other Bone being the foremore is a Proceſs of the firſt Bone of the upper Jaw, and which maketh the lower ſide of the leſſer or outer corner of the Eye. Theſe two are joined by a ſlanting or oblique Suture, and being ſo joined do conſtitute this Bone called *Os jugale*. Over this Bone runs the Tendon of the Temporal-muſcle, and alſo the Tendon of the *Maſſeter* or Chewing-muſcle, as they paſs to the lower Jaw. Os jugale.

Some make but two common Bones of the Skull and upper Jaw, not reckoning this for any particular Bone, ſeeing (as has been ſaid) it is formed onely of the two Proceſſes of the Temple and upper Jaw-bone. But ſeeing it is diſtinguiſhed from the others by a particular name (though not of any peculiar ſubſtance) I thought it not abſurd to reckon it for a *third* common Bone.

CHAP. V.

Of the Jaw-bones and their Parts.

THE Bones of the *upper* and *lower Jaws* come next to be ſpoken to, with the firſt of which we will begin.

The Bones of the upper Jaw. This Jaw hath Bones of two ſorts, the one proper to it ſelf, and the other common to it and the Skull. The *common* Bones are the Wedge-like and Sieve-like Bones, and the *Os jugale*, of which we have already treated in the foregoing Chapter. I ſhall therefore proceed to treat of the Bones *proper* to the upper Jaw onely, which make the lower ſide of the Orbit of the Eye, the Noſe, Cheeks and Roof of the Mouth.

1. Zygomaticum. The Bones that conſtitute all theſe Parts are twelve in number, on each ſide of the Face ſix; the *firſt* of which is called *Zygomaticum*, becauſe by its Proceſs it makes up the greateſt part of the *Os jugale*. This is ſeated at, and maketh, the lower part of the outer corner of the Eye.

2. Lachrymale. The *next* is a round, little, brittle and thin Bone, ſeated in the inner corner of the Eye, called *Os lachrymale*, becauſe it has a hole in it through which the ſerous humour that makes the tears in Men doth iſſue. Upon this hole the little Kernel called *caruncula Lachrymalis* reſteth, that hindreth the continual gleeting of the foreſaid humour. There is alſo in the lower part of this Bone another hole which goes to the cavity of the Noſtril, through which doth paſs a branch of the fifth pair of Nerves to the inner Skin of the Noſe.

3. Innominatum. The *third* is ſeated in the inner ſide of the Eye, and within is continued with the fungous Bones of the Noſtrils. It is broad, and ſomewhat quadrangular or four-corner'd, alſo thin and tranſparent, like the Scale of a Fiſh. On its outſide it is ſmooth, but within rugged and unequal, becauſe of the Scales that cleave unto it. It is joined to four Bones, *viz.* to the Fore-head-bone, to the Wedge-like Bone, to the ſecond Bone of the Jaw, (*viz.* the next foregoing) and alſo to the fourth, or next following. It is not known by any peculiar name; I have therefore made bold to call it *Os innominatum*.

4. Os malæ, or Cheek-bone. The *fourth* Bone is called *Os malæ*, the Cheek-bone, becauſe it maketh up the greateſt part of the *Cheek*, as alſo of the Palate. It likewiſe contains the upper Teeth in its cavities or caverns. *Its connexion.* It is much larger than any other Bone of the upper Jaw, and is circumſcribed with many Sutures; for not to mention the Teeth that are inarticulated into it, it abutteth upon or is joined to ſeveral Bones. In the firſt place it is joined above, on the ſide next the Noſe, to the Bone of the Fore-head; below, to the Wedge-like Bone, and the Bone of the Palate of the Mouth; before, to the *Os lachrymale*, and to the fifth Bone that makes the upper part of the Noſe, (which is next to be deſcribed;) and laſtly to its own companion, *viz.* the Cheek-bone of one ſide to that of the other.

Its Holes. This Bone hath three perforations or *holes*, two of which are under the Orbit of the Eye; that is, on each ſide one, running from the lower part of the Eye outward. Their *uſe* is to tranſmit or let paſs two branches of the fifth pair of Nerves out of the Orbit of the Eye to the Face, on the Parts whereof they are beſtowed.

The

The *third* of these holes is in the Palate, at the backside of the Grinding-teeth where both Bones of the Jaw meet. It is presently divided into two, one of which runneth on one side of the *septum* of the Nose, and the other on the other, to the Nostrils, to which there pass through these holes a small Vein and a small Artery.

It hath also a den or cavity on each side, by the side of the Nose under the Orbit of the Eye, which is covered with a very fine Membrane. This is often full of a mucous or slimy phlegm.

5. The Nose-bone.

The *fifth* Bone of the upper Jaw doth with his companion make the bony prominence of the Nose. It is a small Bone, in figure almost four-square. It is hard, solid, and reasonable thick, having sundry small perforations in it. It is joined above to the Fore-head-bone, *viz.* to its internal Process. In the sides above it is joined to the first Bone, and a little lower to the fourth Bone of this Jaw. In the middle it is joined to its companion, and below to the Gristles that make the lower part of the Nose.

Its connexion.

6. The Palate-bone.

The *sixth* is that which makes up the Roof of the Mouth, with its companion; for you must reckon every one of these Bones double, one on one side of the Face, and another on the other. It is a broad Bone, thin and solid, and in the end, where it is rough, it resembleth a semicircle. It is joined behind to the Wing-like Processes of the Wedge-like Bone, and on the inside, to the Partition-bone of the Nostrils. It is likewise joined to the fourth Bone of this Jaw or Cheek-bone, and lastly to his companion or fellow in its back-part.

This Bone hath also two perforations, on either side one, running upward and backward to two of the holes of the Wedge-like Bone.

The lower Jaw-bone. Its Processes and Sinus's.

The *lower* Jaw comes next to be treated of, which makes the lower part of the capacity of the Mouth. This differs from the former in that it is moveable, whereas the upper is not. In shape it is long and prominent. At both the ends of it, there are two *Processes*, which are by some called *Horns*. The *foremost* of them runs upward, and from a broad basis grows sharp, ending into a cone or point. This point receives the Tendon of the Temporal Muscle, which Tendon compasseth it round about, and is strongly implanted into it: from whence it is that a luxation of the lower Jaw, because of the distention of this Tendon that happens thereupon, is very dangerous, and hard to cure.

The other being the *backward* Process, is called *Articularis*, because it serves for articulation. This hath a neck and a longish head, (called *Condylus*) that is covered with a Cartilage for its easier motion: By this head it is articulated into the *Sinus* of *Os petrosum*, that is also lined with a Cartilage, and is knit thereto strongly by a membranous Ligament. At the sides and roots of these Processes it hath shallow Sinus's or Cavities in its surface, but they are deeper on the inside than on the outside. The principal use of both seemeth to be for the passage or insertion of the Muscles.

Its Cavities and Holes.

This Bone of the lower Jaw is very hard, and for the most part very solid, to make it the stronger. Yet on each side (more backward than in Men) it hath a Cavity within it, which contains a marrowy juice for its nourishment. It hath also four perforations or holes, of which two are at the roots of the Processes, by which a branch of the fifth pair of Nerves, as also a Vein and Artery do pass to the Teeth. The two other holes

holes are in its fore-part by the ſides of the Chin, through which two twigs of the ſaid fifth branch of Nerves do paſs out again to the lower Lip, and its Muſcles and Skin.

The Sockets of the Teeth. This lower Jaw as well as the upper hath Sockets for the Teeth to ſtand in, in number equall to the Teeth, which Sockets are called by the Latins *Alveoli* or little Pits. Theſe are digged deep, that the Teeth like ſo many Nails might be the firmlier faſtned in them. When any of the Teeth fall out of them, (as the Foal-teeth, &c.) in a ſhort time they are obliterated, the Jaw becoming ſmooth without any pit in it in that place.

Table XXXVII.

Repreſents an Horſe's Head and Jaws as much of them as can be ſeen by the Head ſtanding with one ſide towards us; and ſhews thoſe Bones which could not ſo well be ſeen in the foregoing Table, where the Head is repreſented in one Figure with the top, and in the other, with the bottom of it towards us.

Figure I.

A *The Temple-bone on which the Temporal Muſcle is placed.*

B *A hole in the Skull through which doth paſs forth from the Brain a ſmall Nerve, which is diſperſed about the top of the Skull.*

DD *The Bones which make the top of the Noſe.*

HH *The* Os jugale.

F *The hole through which doth paſs a branch of the Nerve of the fifth conjugation, which furniſheth the Muſcles of the upper Lip and alſo the Muſcles of the Noſtrils with Nerves.*

L *The round production of the upper Jaw, which production is called* cervix.

M *The Auditory Paſſage or hole of the Ear.*

N *The Mammillary Proceſs of the Temple-bone.*

OOO *The lower Jaw-bone.*

P *The hole where the Nerve of the fifth pair comes forth, which Nerve furniſheth the Muſcles of the lower Lips with twigs from it.*

Q *The Production of the lower Jaw, which doth articulate into the upper.*

K *The Noll-bone.*

Figure II.

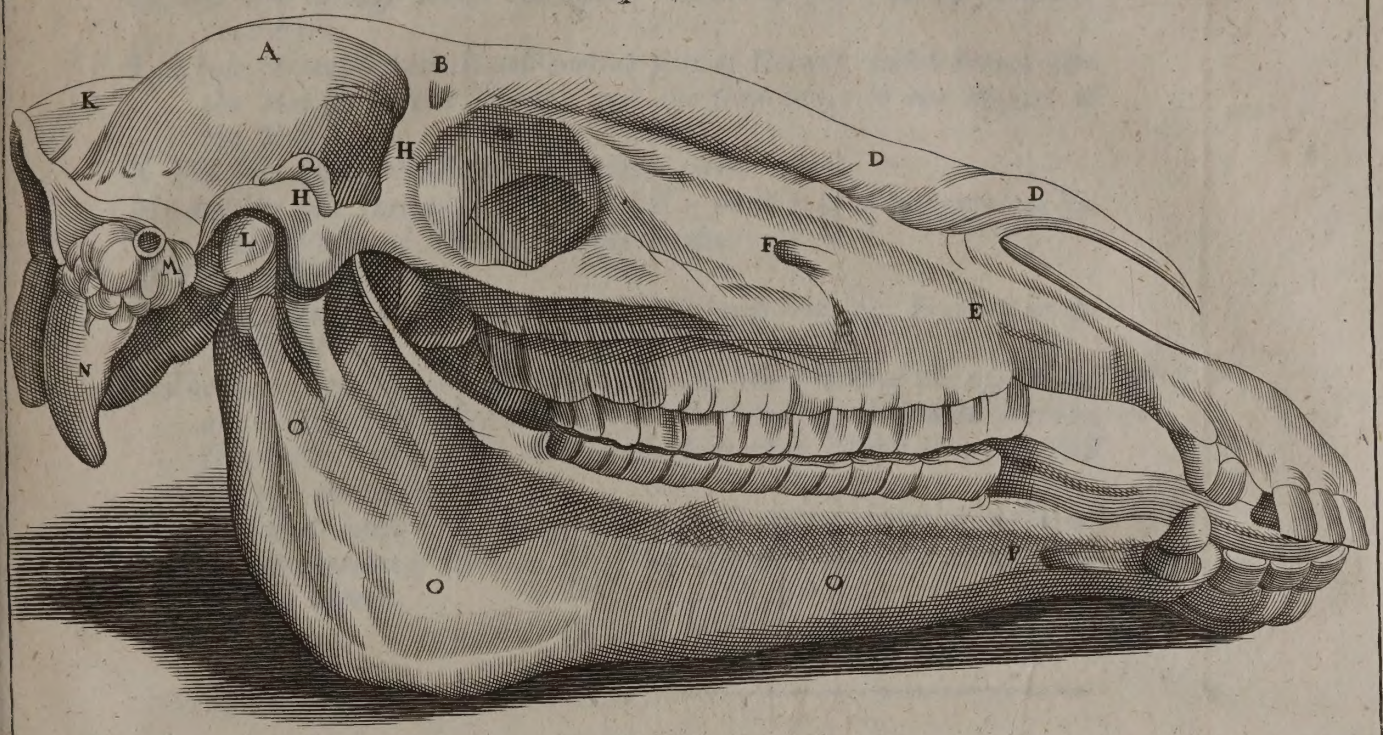
Repreſents the Skull and upper Jaw onely, the lower Jaw being removed, the better to ſhew the ſeveral perforations in the ſide of the bottom of the Skull, which perforations or holes in the other Figure are hid by the articulation of the lower Jaw.

A *The hole by which the Nerve paſſes from the Brain to the upper Jaw.*

E *A hole whereby a ſmall Nerve doth paſs from the Brain, which is diſtributed upon the bottom of the* Occiput, *and other Parts at the bottom of the Skull.*

TAB XXXVII.

I



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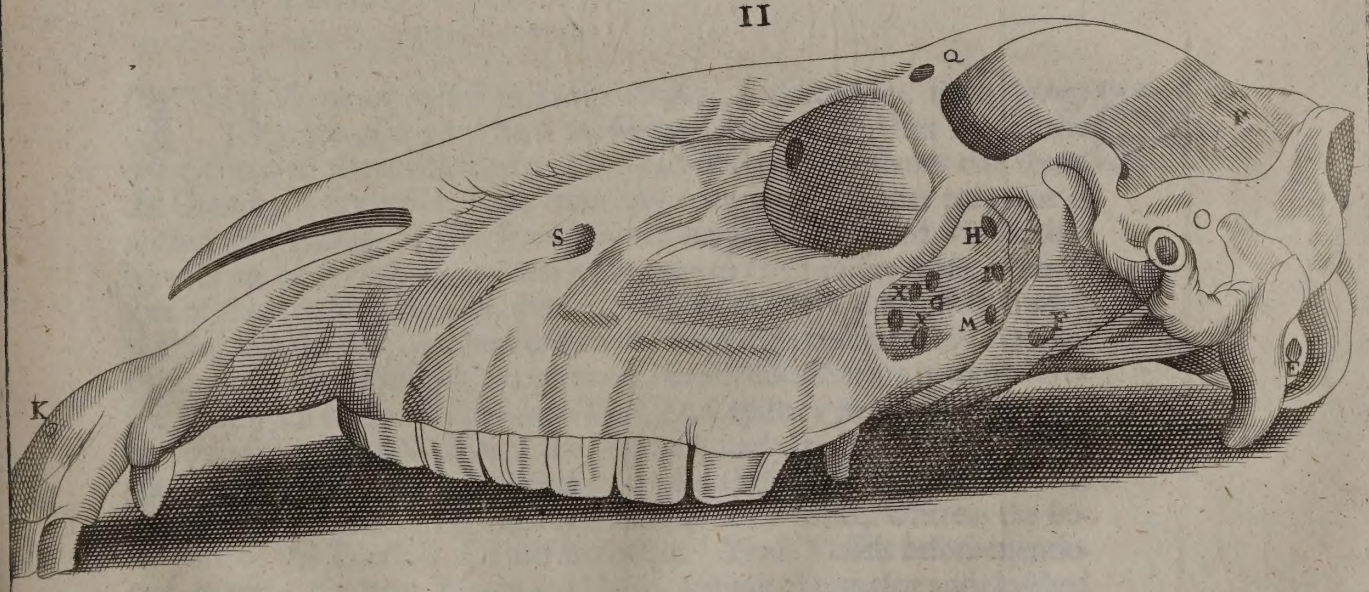
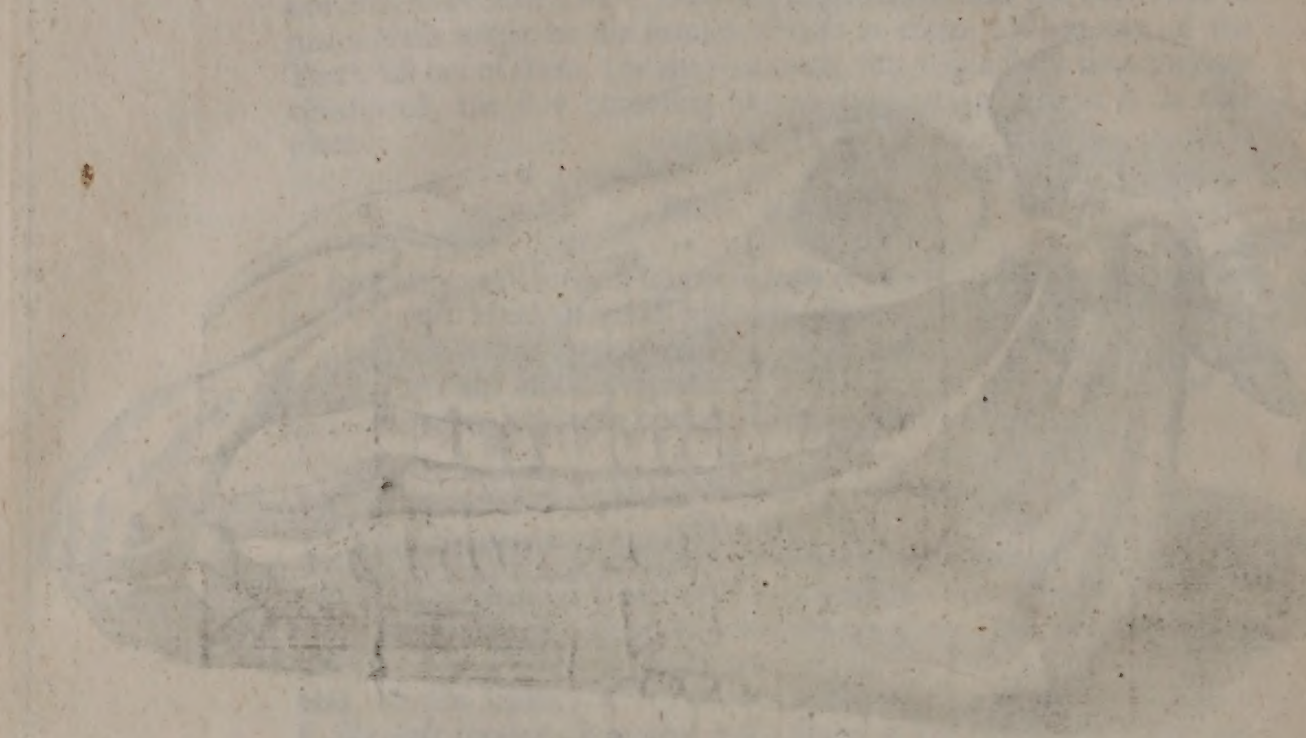




F *A hole by which a branch of the external Jugular Vein and Artery doth paſs to the Brain.*

G *A hole through which do paſs the ſixth pair of Nerves, according to Doctor* Willis.

H *The hole through which the Optick Nerves do paſs from the Brain to the Eyes.*

I *A hole through which do paſs another pair of Nerves, which branch into the Muſcles of the Tongue, and alſo ſend twigs to the Muſcles of the Ears.*

K *The hole where the Palate-vein comes forth.*

M *Another hole through which doth paſs a ſmall twig of the external Jugular Vein and Artery up to the Brain.*

O *The Auditory Paſſage.*

Q *A hole through which a ſmall Nerve doth paſs from the Brain to be diſtributed about the top of the Skull.*

S *The hole where the Nerve of the fifth pair comes forth of the upper Jaw after it hath furniſhed the roots of the Grinding-teeth with Nerves, from whence it marches towards the lower Lip, where it is diſperſed amongſt the Muſcles thereof.*

XX *Two other holes in the bottom of the Skull through which do paſs other conjugations of Nerves, which are diſperſed about the Head, Face and Mouth.*

CHAP. VI.

Of the Figure, Magnitude, Number and Articulation of the Teeth.

The Teeth. Their ſubſtance and Veſſels.

THE *Teeth* are called in Latin *Dentes, quaſi Edentes*, from *eating*. They are of a very hard ſubſtance, yea, harder than any of the other Bones in the whole Body. That part of them that ſtands out above the Gumm, is ſmooth and free from any covering; but that part that is within the Sockets of the Jaws is more rough and covered with a thin Membrane or *Perioſteum*, which Membrane is of exquiſite ſenſe. Thoſe ſort of them which we call the Grinding-teeth, have a manifeſt Cavity within, but the *Inciſores* (or Fore-teeth) and Dog-teeth have but very obſcure ones. Into theſe Cavities by the very ſmall holes that are in the roots of the Teeth, are received (into each Tooth) a Capillary Artery from the *Carotides*, alſo a ſmall Vein from the Jugulars, and a twig of a Nerve from the fifth pair; which Nerve being expanded through the thin Membrane that inveſts the ſaid Cavity, gives it a moſt acute ſenſe; whereas the bony part of the Tooth is of it ſelf inſenſible. Theſe Veſſels before-mentioned, namely, the Vein, Artery and Nerve, are united together and cloathed with a common Coat when they enter the Jaw, within which they have a proper chanel to run along in under the roots of the Teeth, to each of which roots they ſend ſmall twigs as they paſs by, as aforeſaid.

As

Three ſorts of them.

1. Inciſores. As in Men, ſo in Horſes, there are three kinds of Teeth, namely, *Inciſores*, *Canini* and *Molares*. The *Inciſores*, Cutters or Shredders are thoſe we call the Fore-teeth from their being ſeated in the fore-part of the Jaw. They are ſharp-edged like a Knife, and broad alſo, that they may the better bite off or crop the Graſs, *&c.* They are in number twelve, that is to ſay, in each Jaw ſix. They have each but one root or phang, though that root is indifferent large, moſt times larger than any one of the phangs of the great or Grinding-teeth.

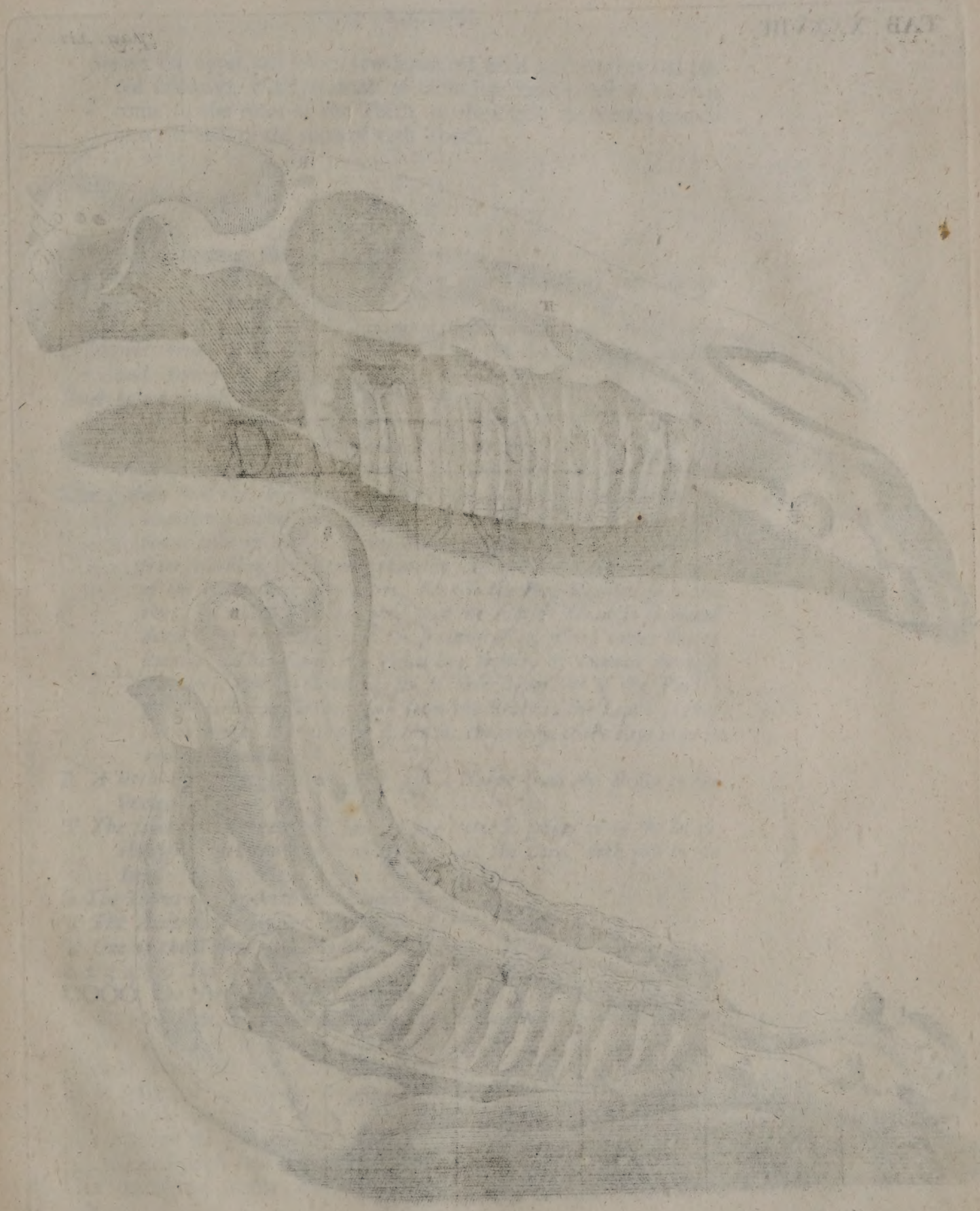
2. Canini. The next to theſe are thoſe which in Horſes we call the *Tuſhes*, but in Men they are called the Dog-teeth or *Canini*, not onely becauſe in figure they are like the Teeth of a Dog, and ſtand out of the Gumms as Dog's-teeth do; but from their uſe alſo, which is to gnaw upon and break (with their ſharp points) what is too hard for the Fore-teeth to cut or ſhear in ſunder. The roots of theſe as of the former are ſingle, having but one phang.

3. Molares. Thoſe of the third rank, are the double Teeth, which are called *Molares*, or Grinders, becauſe the Meat is broken or ground by them, even as Corn is ground by the Mill-ſtone. Theſe are in Horſes twenty four in number, in each Jaw twelve. Their ſeat is in the inner part of the Mouth, being environed in their outſide by the Cheeks, leſt the broken or ſhredded Meat, being rowled by the Tongue upon the Teeth, ſhould ſlip over them out of the Mouth, before it be ſufficiently ground.

How to know the age of an Horſe by his Teeth.

The two foremoſt of theſe Teeth, ſtanding next to the Dog-teeth or Tuſhes, are thoſe by which the age of an Horſe is known till after ſeven years old, and that by their unevenneſs at the top, having ſeveral little thin ſhells or ſcales as it were ſticking up round the outſide of the top of them, whereby their middle part is made to appear hollow; which hollowneſs where it is found, is a certain ſign of the Horſe's being under ſeven years of age. And it is alſo to be obſerved, that the nearer the Horſe comes to that age, the more doth that hollowneſs grow out by degrees: ſo that when he comes to be full ſeven years old it is quite obliterated, and ſo the Horſe's age to be no more known by that ſign, being paſt the mark in the Mouth as we ſay: for by the perpetual uſe that the Horſe makes of his Teeth, the before-mentioned Shells at the top of them, which cauſe their hollowneſs, are worn down even with the other parts of the Teeth, ſo that the whole top of the Tooth becomes even, ſmooth and plain.

Neither are the reſt of the Grinding-teeth without ſome hollowneſs or at leaſt roughneſs in their tops; but this is of a different nature from the other: which roughneſs or unevenneſs is very neceſſary, for by it they are made more fit for the comminution of the Meat: For as Millers when their Milſtones are grown ſmooth, do pick them anew, to make them grind the better; ſo hath Nature made the upper part of theſe Grinding-teeth, elegantly to imitate the rough ſuperficies of a Milſtone, having here and there formed little pits in them. We ſhall not need to ſhew the uſes of theſe, or of either the foregoing ſorts of Teeth, that being intimated ſufficiently in the deſcription of them.



TAB. XXXVIII.

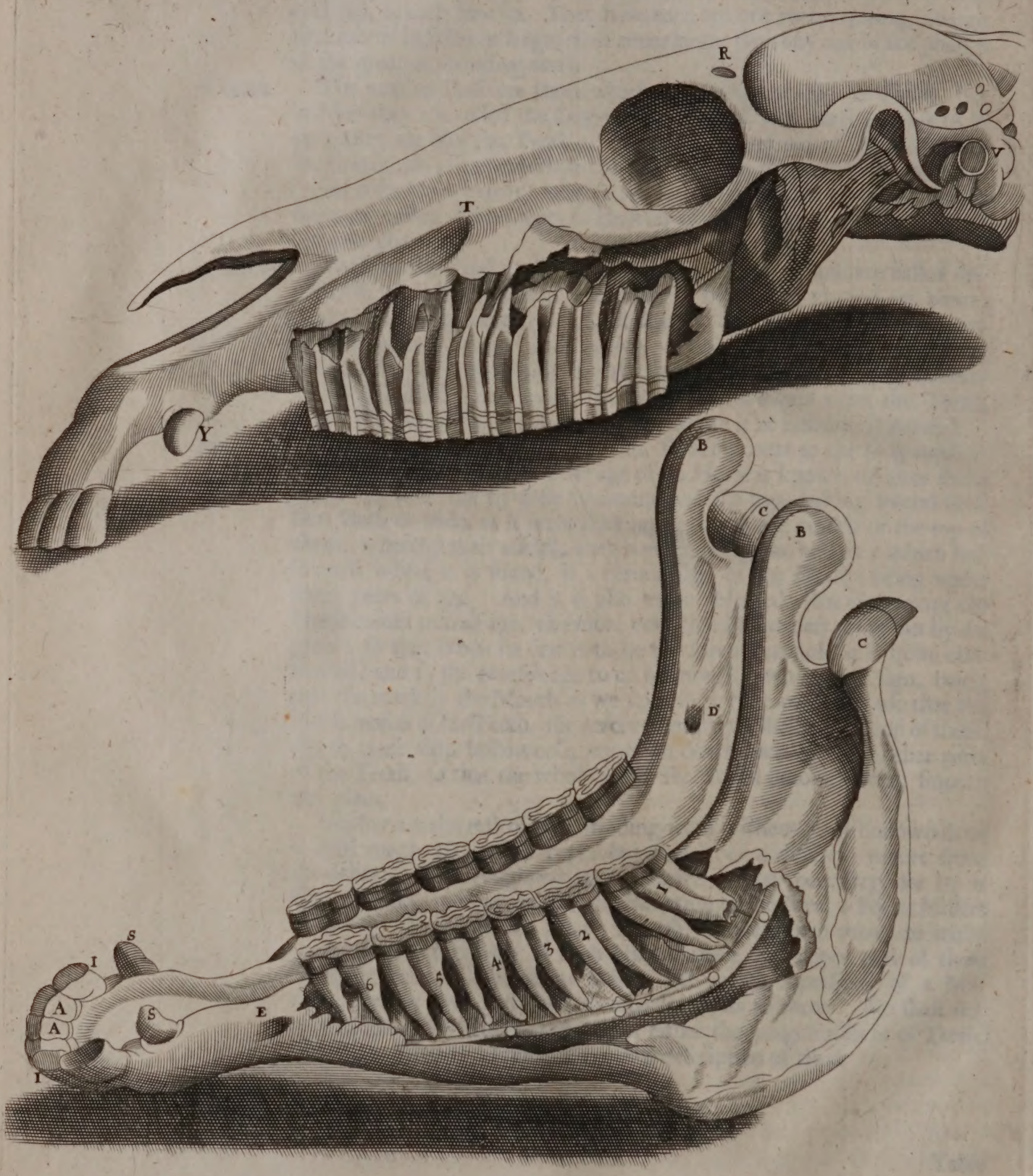


Table XXXVIII.

Shews the upper and lower Jaw ſeparated from one another and placed ſideways, with ſo much of each Jaw broken off as till one come to the roots of the Teeth, to ſhew how the Nerves branch into the ends of the roots of each Tooth.

Figure I.

A A *The Shearers or Fore-teeth.*

B B *The two Productions of the lower Jaw which articulate into the upper Jaw.*

C C *The Proceſs into which the Temporal Muſcle is inſerted.*

D *A hole through which doth paſs a branch of the external Jugular Vein and Artery.*

E *A hole through which doth paſs the Nerve that furniſheth the Teeth with twigs from it as it paſſeth along, (being a branch of the fifth pair) which trunk doth afterwards loſe it ſelf about the Lips, furniſhing all the Muſcles of the Lips and Noſe with Nerves.*

☞ *(Note that this Nerve in the upper Lip is that which Farriers do improperly (and by a miſtake) call* the Cord, *which they many times take up with a Cornet and cut inſunder to prevent a Horſe from ſtumbling; believing that the ſaid Cord reaches from the tip of the Noſe where they cut it, down to the Fore-legs and ſo to the Feet, by which they imagine that the Horſe's Head is ſo bound down, that he cannot have the freedom of it, which cauſes him to ſtumble. This fancy how ridiculous ſoever, is common amongſt Farriers, and is owing merely to their ignorance of the Parts; for it reaches no farther than from the Brain to the Lips: ſo that the cutting of it is likelier to hinder the motion of the Lips than to remedy ſtumbling.)*

R *A little hole through which doth paſs a Nerve from the Brain to the* Pericranium.

T *The ſame hole in the upper Jaw, as the letter* E *points to in the lower, through which the Nerve which they call the Cord, doth paſs to the Lips.*

S *The Tuſhes or Dog-teeth of the lower Jaw.*

V *The Auditory Paſſage or hole of the Ear.*

Y *One of the Tuſhes of the upper Jaw.*

1 2 3 4 5 6 *The Grinding-teeth.*

OOOO *The Nerve that ſends twigs to the roots of the Teeth of the lower Jaw, being the firſt branch of Doctour* Willis *his fifth pair.*

CHAP. VII.

Of the Bone of the Tongue called Os hyoides.

Os hyoides. Its figure and parts.

THAT Bone which is called *Os hyoides*, is of the ſhape of a Greek *υ (ypſilon)* and is ſeated under (or at the root of) the Tongue, being as it were the foundation and ſupporter of it. It is compounded of three Bones, *viz.* one in the middle, (being larger than the other two) which is gibbous forwards (or outwards) and ſomewhat hollowed inwards; by its gibbous ſide it is joined to the baſis or bottom of the Tongue: The other two Bones are lateral, and are called *Cornua*, or Horns. To the firſt Bone there are affixed two Griſtles, and to each of theſe one. They are all tied to the adjacent parts, partly by a fleſhy, partly by a nervous ſubſtance. It hath three *Sinus* or Cavities; above, a tranſverſe depreſſed *Sinus*, to admit the ſecond pair of Muſcles proper to it; and in the ſides of this *Sinus* there are two other, which give way unto the firſt pair of Muſcles that are implanted into the ſides of this Bone.

Its Uſe.

The *uſe* of this Bone (although it be but a little one) is very great; for moſt if not all the Muſcles that move the Tongue either are inſerted into it or ariſe from it. It ſerves alſo to keep the Throat open, admitting the *Epiglottis* or Throat-flap into its boſom, when it is lifted up in breathing. And laſtly ſome of the Muſcles of the *Larynx* or Throttle ariſe from it.

CHAP. VIII.

Of the Bones of the Neck.

HAving treated of the Bones of the *Head*, we come in the next place to ſpeak to thoſe of the *Neck*; which, in dividing the Body into three Parts at the beginning of this Fifth Book, (*viz.* the Head, Trunk and Limbs) we conſidered as annext to the Head. Its Bones are of two ſorts, *viz.* the Collar or Chanel-bones, and the *Vertebræ*. But firſt of the *Collar-bones*.

The Collar-bones, their ſubſtance and uſe.

Theſe are in number two, one on each ſide. They are called *Claviculæ*, either from their reſembling the ſhape of old-faſhioned Keys, which were of the ſhape of an Italick *ſ*; or becauſe they lock up as it were and cloſe the Cheſt; for by ſome they are accounted as belonging to *it*. Their ſubſtance is ſpongy and thick, eſpecially about their heads; but in their middle they are thin and flat. By one end they are joined to the top of the Breaſt-bone, and by the other to the firſt Rack-bone of the Back, wherein they differ from thoſe in Man, which are jointed into the

the Proceſs of the Shoulder-bone. Their *uſe* is to uphold the Shoulder-blades, that they ſhould not ſlide down upon the Breaſt together with the Shoulder-bone, which upon a diſlocation or fracture of theſe Collar-bones doth often come to paſs.

The Vertebræ of the Neck, their number and holes.

The number of the *Vertebræ* or Rack-bones of the *Neck* is ſeven, and they are reckoned from the Head downward; that next the Head being the firſt. They have in each of them a large Cavity as thoſe of the Back and Loins have, to give way to the Spinal Marrow to deſcend by. Beſides this large hole which is common to theſe with thoſe others, they have alſo each of them two other ſmaller holes in their tranſverſe Proceſſes, through which the Cervical Veins and Arteries do paſs to the Head. And betwixt their jointing one with another there is a third hole, or rather half of one, for one half is formed out of the lower ſide of the upper, and the other out of the upper ſide of the lower *Vertebra:* By theſe the Nerves paſs out from the Spinal Marrow.

The firſt deſcribed.

The *firſt* of theſe Bones is called *Atlas*, becauſe in Men the Head ſtands upon it like the Globe of the World, as the Poets feigned *Atlas* to bear the Celeſtial Globe upon his Shoulders. The body of this Bone is more ſlender, but ſolider than the reſt, and it wanteth its hinder Proceſs or Spine, having onely a kind of a ſemicircular knob jetting out inſtead of it: the reaſon of which ſeems to be, leſt the greater ſtreight pair of Muſcles of the Head that ſpring from the ſecond *Vertebra* of the Neck, and march over the back-ſide of this, ſhould be hurt in bending the Head forwards. But it has all its other Proceſſes, *viz.* aſcending, deſcending and tranſverſe. Within on the fore-ſide of its great *Foramen*, it has a *Sinus*, in ſhape ſemicircular, which is lined with a Cartilage or Griſtle, and which receiveth the Tooth-like Proceſs of the ſecond *Vertebra*.

The ſecond, &c. deſcribed.

The *ſecond Vertebra* is called *Dentata*, becauſe out of its upper ſide, between its two aſcending Proceſſes, there ſprings an Appendix or Proceſs, round and long, like the Dog-tooth in Man (or Tuſh in a Horſe.) This Tooth is covered with a Cartilage, and is jointed into the foreſaid *Sinus* of the firſt *Vertebra*, and upon it, as upon an Axle-tree, the head turns round, from whence the whole Bone is called by ſome *Axis*. That part of the Tooth which enters not into the ſaid *Sinus* (*viz.* its baſis) is encompaſſed with a Ligament, which knits it to the *Occiput*. This and the four following have Spines or hinder Proceſſes, each of which are divided into two for the better connexion of the Ligaments and Muſcles to them. We ſhall not need to deſcribe particularly any more of them, ſeeing they are in all things like to the ſecond, ſaving that their lateral Proceſſes are larger, and divided into two as well as the hinder: yea the ſeventh it ſelf differs not from the reſt, though in Man it do.

The bodies of theſe *Vertebræ* of the Neck are longer than thoſe of the Back or Loins; for though the Neck of an Horſe be of ſo conſiderable length, yet as hath been ſaid its *Vertebræ* are but ſeven (as they are in Man) whereas thoſe of the Back and Loins are twenty four in all, which ſpace notwithſtanding is not ſo long again as the Neck is; whereas were the *Vertebræ* of a proportionable length, it ſhould be more than three times the length.

Table XXXIX.

Repreſents the ſeven *Vertebræ* of the Neck all joined together in one Figure. They are placed ſo, as that the firſt Figure ſhews their ſides, the ſecond their back-parts, and the third their fore-parts.

Figure I.

A *Shews a hole through which a branch of the internal Jugular Vein and Carotid Artery comes forth of the firſt* Vertebra, *having entred the ſame* Vertebra *at the hole marked with the letter* F.

B *A hole in the ſaid* Vertebra *out of which doth paſs the firſt Nerve from the Spinal Marrow without the Skull, which Nerve marches ſtreight to the beforeſaid Vein and Artery and joins it ſelf with them, and runs their courſe both up to the Head and down to the Body, there being an aſcending and a deſcending branch of it for that purpoſe.*

C D E *The ends of the ſaid Vein, Artery and Nerve where they were cut off with the ſeventh* Vertebra *from the Trunk of the Body.*

F *The hole in the firſt* Vertebra *by which the Vein and Artery entred the ſaid Bone, and come out again at the letter* A.

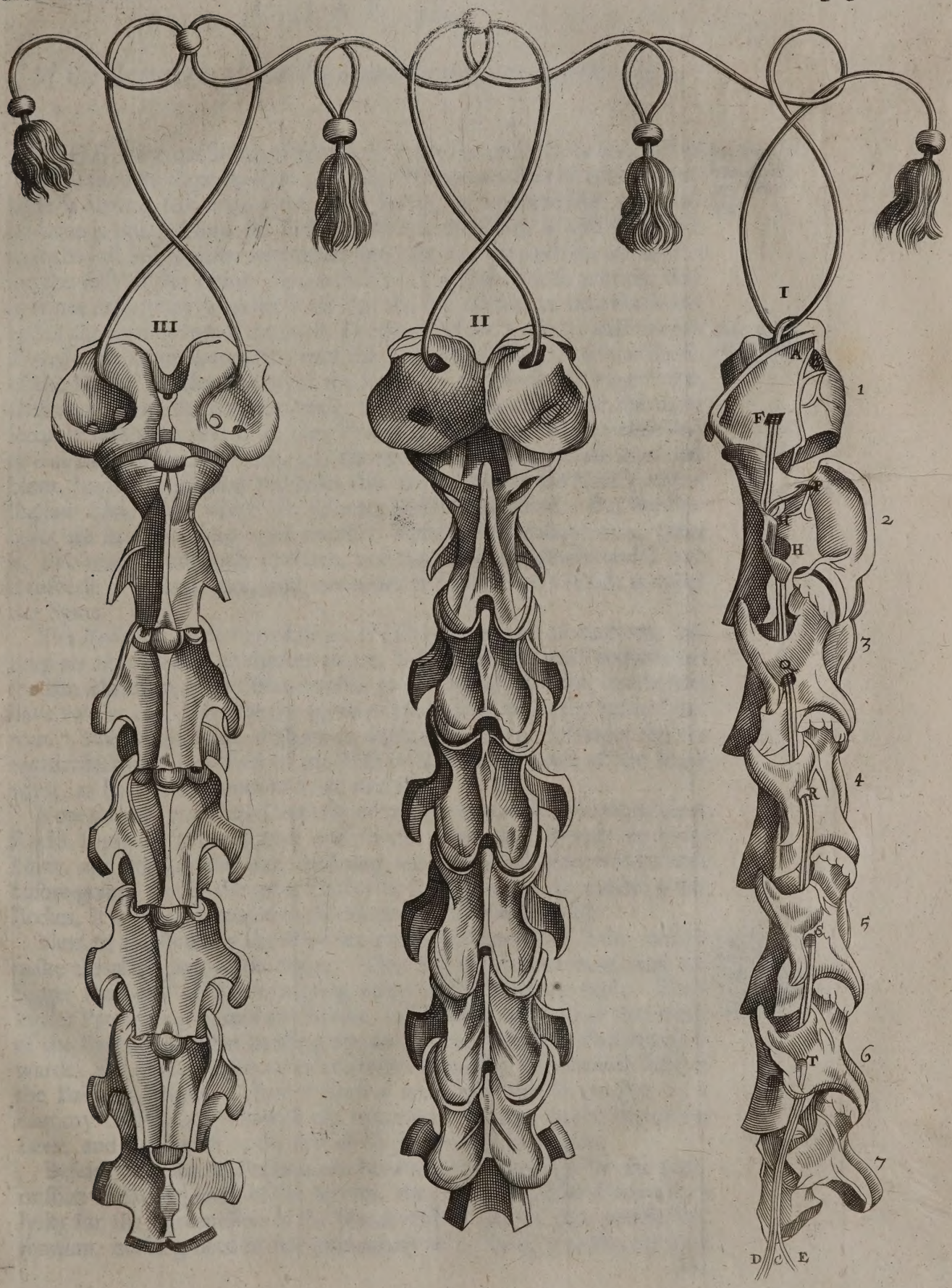
P *The hole betwixt the firſt and ſecond* Vertebra *through which doth paſs the ſecond pair of Nerves of the Spinal Marrow.*

H H Q R S T *The reſt of the holes in the other ſix* Vertebræ, *through which the Jugular Vein and Artery, and the Spinal Nerves do paſs in and out.*

1. 2. 3. 4. 5. 6. 7. *The ſeven* Vertebræ *of the Neck.*

Figure II. Shews the back-ſide, and Figure III. the fore-ſide of the ſaid *Vertebræ*.

CHAP.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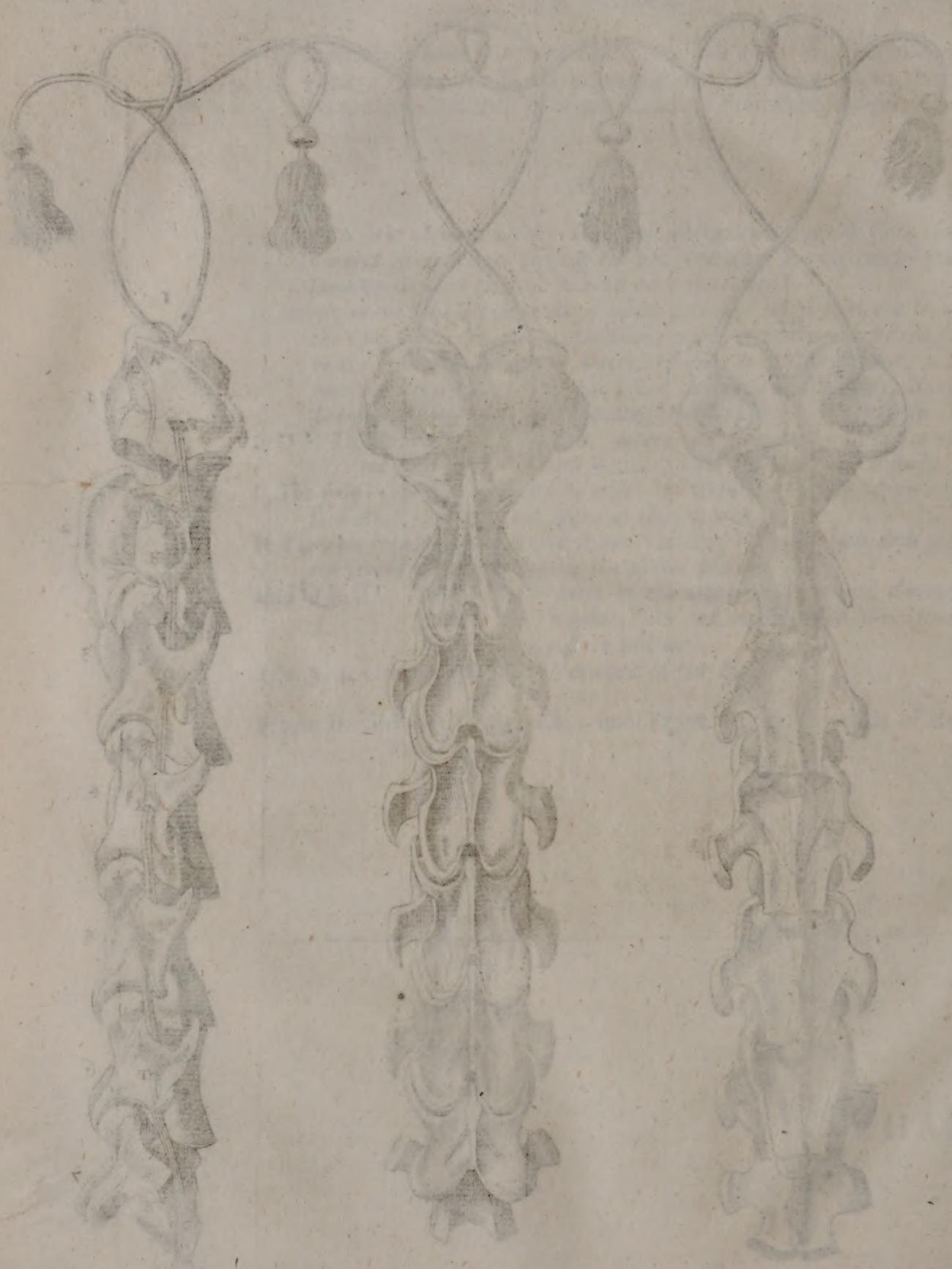

CHAP. IX.

Of the Vertebræ *of the Back and Loins; and of the Ribs.*

THE *Back* conſiſteth of ſeventeen *Vertebræ* or Rack-bones, juſt ſo many as there be Ribs on a ſide, for on each ſide of every Rack-bone is there a Rib articulated. But ſeeing, as we have ſaid, the Collar-bone is inſerted into the firſt *Vertebra* of the Back, it will ſo fall out that the laſt Rib will be articulated into that *Vertebra* which we reckon for the firſt of the Loins: into which the Rib indeed is ſo jointed, that it is not eaſy to ſay whether it be into the top of this, or into the lower end of the ſeventeenth of the Back. The *Bodies* of the Racks as well as their *Proceſſes* do differ ſomewhat from the *Bodies* and *Proceſſes* of the Racks of the Neck; for the *Bodies* of the Racks of the Neck are longer than theſe, and more flat on their inſide, that the Gullet might reſt the more ſecurely on them: and as for their *Proceſſes*, the hinder are not cleft into two as thoſe of the Neck are, and the tranſverſe ones are more ſhort and blunt, having (inſtead of the holes that are in thoſe of the Neck) each a ſhallow *Sinus*, into which the Ribs are partly articulated. But the *Proceſſes* are in both of an equal number, namely four oblique ones, (that is, two tending obliquely upwards, and two obliquely downwards) two tranſverſe or lateral ones, and one acute or hinder one, which is called the Spine.

The Back hath ſeventeen Vertebræ.

Their Bodies and Proceſſes deſcribed.

The *Bodies* of theſe *Vertebræ* are not ſo ſolid as thoſe of the Neck, but they are more bulky or thicker about, and are full of ſmall perforations for the admiſſion of the Bloud-veſſels to the Spinal Marrow, and beſides have two at each Joint for the egreſs of the Nerves from the Spinal Marrow. They have each of them on each ſide a *Sinus* or Cavity for the inarticulation of the head of the Rib, which *Sinus* thoſe of the Neck want, as having no Bones to joint into them.

Note that the tranſverſe Proceſſes of two or three of the loweſt of theſe Racks begin to grow ſhorter and ſhorter, and their Spines are more blunt, and ſtand evener out, declining not ſo much downwards as thoſe before-going. As for the great Cavity or Perforation in the middle of the Bodies, it is proportionable to the Marrow which it contains.

Next to the Bones of the *Neck* we come to thoſe of the *Loins*, which make the third part of the Spine. They are in number ſeven, and are bigger than any of the fore-going either of the Neck or Back. Their hinder Proceſſes or Spines are ſhorter, but broader and thicker than thoſe of the Back, ſomewhat bending upwards as moſt of thoſe decline downwards; but as for the lateral or tranſverſe Proceſſes, they exceed thoſe of the Back in length. Theſe *Vertebræ* are joined one to another by a clammy Griſtle, and likewiſe the uppermoſt of them to the laſt of the Back, and the loweſt to the firſt of *Os ſacrum* in like manner.

The Loins have ſeven. Their Bodies, Proceſſes and connexion.

Beſides their lateral Perforations betwixt their jointings for the tranſmiſſion or letting forth of the Nerves, they have alſo ſeveral other little holes for the intromiſſion of the Bloud-veſſels. As for their middle Perforation, nothing need be ſaid particularly of it, ſeeing it differs not from that

that of thoſe of the Back, being of capacity equal to the thickneſs of the Marrow that it contains.

The Ribs are ſeventeen. The *Ribs* (in Latin *Coſtæ*) are in number thirty four, that is to ſay, on each ſide ſeventeen. Their ſubſtance is partly bony, and partly cartilaginous or griſtly; the firſt ſerving for firmneſs, and the latter for articulation, that upon occaſion they might yield a little without breaking. They are divided into two ſorts, the one called *true*, and the other the *Nine* true. *Baſtard*-ribs. The *true* are the nine uppermoſt, ſo called becauſe each with its fellow makes a compleat circle, being joined together by the mediation of the Spondyls of the Back behind, and the Breaſt-bone before. I ſay the Ribs are articulated into the Back-bones behind, ſomething of a cartilaginous ſubſtance coming between: (the manner whereof is well expreſt in the following Figure.) At this articulation into the *Vertebræ* each Rib has two knobs, one of which is received into the *Sinus* of the Body of the *Vertebra*, and the other which is leſs, into that of the tranſverſe Proceſs. And they are joined before to the Breaſt-bone by way of articulation alſo; for their Cartilages end into little heads which are received into the ſmooth *Sinus's* of the Breaſt-bone.

Eight baſtard. The *Baſtard*-ribs are the eight lower, being of a more ſoft and griſtly ſubſtance than the other; becauſe being articulated onely at one end, it was neceſſary they ſhould be of a more yielding and pliable nature, otherwiſe they would have been very apt to break. Yea their yielding is not onely a ſecurity to themſelves, but very convenient in reſpect to the parts that are contained under or within them. For ſeeing the Stomach lies in this region which uſes to be diſtended with Meat or Water, theſe Ribs ought to give way to it when it or the intermediate parts, as the Liver and Spleen, bear againſt them.

Their figure. The *figure* of the Ribs is (as you may alſo ſee in the following Figure) ſemicircular, like a Bow when it is drawn; which Nature hath ſo ordered to make the Cheſt ſtronger and more capacious.

Their ſurface. They are on the outſide rough and unequal, eſpecially near the *Vertebræ*, that the Ligaments might take the firmer hold on them, by which they are tied to the Rack-bones: but on their inſide they are ſmoother (being covered with the *Pleura*) leſt they ſhould hurt the Lungs and other Parts that bear againſt them. They are all of them narrower and roundiſh toward the Back, and broader and flatter toward the Breaſt. In their lower and inner part they have a furrow that runs along them, in which a Nerve and the Bloud-veſſels are conducted.

Their uſes. The *uſes* of the Ribs are, firſt, to be a defence to the Bowels within the Breaſt, and to the Stomach, Liver and Spleen in the Lower Belly; and ſecondly, to ſupport the Muſcles which ſerve for reſpiration, and to be moved by them: for which cauſe the Breaſt ought not to conſiſt of one Bone, for then it would have been immoveable; whereas now it eaſily admits of dilatation and contraction.

CHAP.

CHAP. X.

Of the Sternum *or Breaſt-bone, and of the* Scapula *or Shoulder-blade.*

THE Breaſt-bone in an Horſe is not flat on the outſide as it is in Men, but ſtands out with a ridge, and is ſomething like the keel or bottom of a Boat, jetting out with its middle on the outſide, and is hollow on the inſide. It is of a ſpongy ſubſtance, neither ſo ſolid nor ſo white as moſt of the other Bones of the Body. In Foals it is rather griſtly than bony, and does then conſiſt of more parts than it does in grown Horſes; for as by age the Griſtles grow into a bony ſubſtance, ſo they do unite ſo one to another in time, that no footſteps are left of their firſt diviſion. *The Sternum, its figure and ſubſtance.*

In its upper part towards the Throat it is rather pointed and ſharp, than horned as it is in Men; however on the inſide it is hollowed, for the more convenient deſcent of the Wind-pipe. Without on each ſide of its upper end there is a little *Sinus* into which the heads of the Collar-bones are received or articulated. Betwixt which articulation of the Collar-bones into it, and its lower end, there are ſeveral *Sinus* on each ſide of it, to the number of nine, into which the griſtly ends of ſo many true Ribs are jointed. Its lower end terminates in a Griſtle even in old Horſes, whoſe end is of a more obtuſe or blunt ſhape than in Men, in whom it is called *Cartilago enſiformis*, or the Sword-point-like Griſtle. *What parts articulate into it.*

Its *uſe* is for the articulation of one end of the Collar-bones and true Ribs into it, and to ſerve as a Breaſt-plate for the ſafeguard and defence of the noble Bowels (*viz.* the Heart and Lungs) that are lodged within it. *Its Uſe.*

The *Shoulder-blade* is called in Latin *Scapula*. There are two of them (*viz.* on each ſide of the upper part of the Cheſt one) as there are of all the ſorts of Bones in the fore and alſo in the hinder Legs; but we ſhall for brevity's ſake ſpeak of the Bones onely of one Leg before and another behind, becauſe the other two are in all things like unto theſe, wherefore it is not any way neceſſary to repeat the deſcription of them, nor yet to ſpeak of them in the plural number.

The *Shoulder-blade* is ſeated upon the ſide of the true Ribs, (like a Target) reaching from the *Vertebræ* of the Back almoſt to the bottom of the Collar-bone. It is in figure after a ſort triangular, on the inſide concave or hollow, and on the outſide prominent or arched. It is jointed to no Bone but by its lower end to the Shoulder-bone; but yet it is knit to ſeveral Parts by the Muſcles that are inſerted into it, or riſe from it; as to the hinder-part of the Head by the Cucullar Muſcles, being the firſt of its movers; alſo to the *Vertebræ* of the Neck by its ſecond pair; and to the Back by the Muſcle *Rhomboides*, &c. *The Scapula, its ſituation, figure and connexion.*

It hath three *Proceſſes*. The *firſt* being the ſhorteſt, is called its *Neck*, which neck ends into a ſinuated or hollow cup or head, which receiveth the head of the Shoulder-bone, and its brim is compaſſed with a thick Griſtle, *Its Proceſſes.*

Griſtle, whereby its Cavity is made the deeper that the head of the Shoulder-bone that is jointed into it ſhould not ſo eaſily ſlip out. The *ſecond* Proceſs, which by ſome is accounted the firſt, is extended along its middle on the outſide, and is called its *Spine*; and that end of this Spine that by a ſhallow Sinus receives one of the Heads of the Shoulder-bone, is called *Acromium*, that is to ſay, its point or tip. The third and laſt of theſe Proceſſes is toward the lower and inſide of the Bone, and from the likeneſs it hath with an Anchor is called *Ancyroides*, Anchor-like; ſome alſo who compare it to a Crows Bill, do give it the name of *Coracoides*: This Proceſs doth ſomewhat help to hold the Shoulder-bone in its place, entring a little into a ſhallow *Sinus* of the ſaid Bone.

Its Appendixes. It hath five Appendixes about its Neck, three of which do afford an original to ſome Muſcles, and from the other two do ſpring Ligaments which join the Shoulder-bone to the head of the Blade.

Its Cavities. By means of the ſecond Proceſs that runs like a Ridge or Spine along the middle of its back there are formed on its outſide two long Furrows or *Cavities*, in which ſeveral Muſcles lie, eſpecially the *Supraſcapularis* and *Subſcapularis*, which are otherwiſe called *Supraſpinatus* and *Infraſpinatus*, from their being placed the firſt above this Spine or on that ſide next the Neck, and the latter below it or on that ſide next the Ribs.

Table XL.

Repreſents all the Bones of the Cheſt, the *Vertebræ* of the Back and the Shoulder-blades.

Figure I.

A B *Shew the length of the Breaſt-bone, (the Bones of the Cheſt being placed in a ſupine poſture.)*

C C *The upper end of the ſame Bone.*

D D *That Griſtle which in Men is called* Cartilago enſiformis *or the Sword-faſhioned Griſtle, at its lower end.*

1. *The Collar-bone, (imitating a Rib.)*

2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. *The ſeventeen Ribs.*

E E E *The ſeveral* Vertebræ *of the* Thorax *into which the Ribs are articulated.*

F F F F *The cartilaginous or griſtly part of the Ribs.*

Figure II.

Shews the ſeventeen *Vertebræ* of the *Thorax* or Cheſt on one ſide, the better to ſhew how the Ribs are articulated into the ſides of the ſaid *Vertebræ*.

A A B *The two Productions of the firſt* Vertebra *of the Cheſt, which were articulated into or with the ſeventh* Vertebra *of the Neck.*

C C C C *Several of the ſmall Ligaments which did bind in the heads of the Ribs into the articulations of the* Vertebræ.

I. II. III. IV. V. VI. VII. VIII. *to* XVII. *The ſeventeen backward Proceſſes or Spines of the Spondyls or Rack-bones of the Cheſt.*

Figure

IIII

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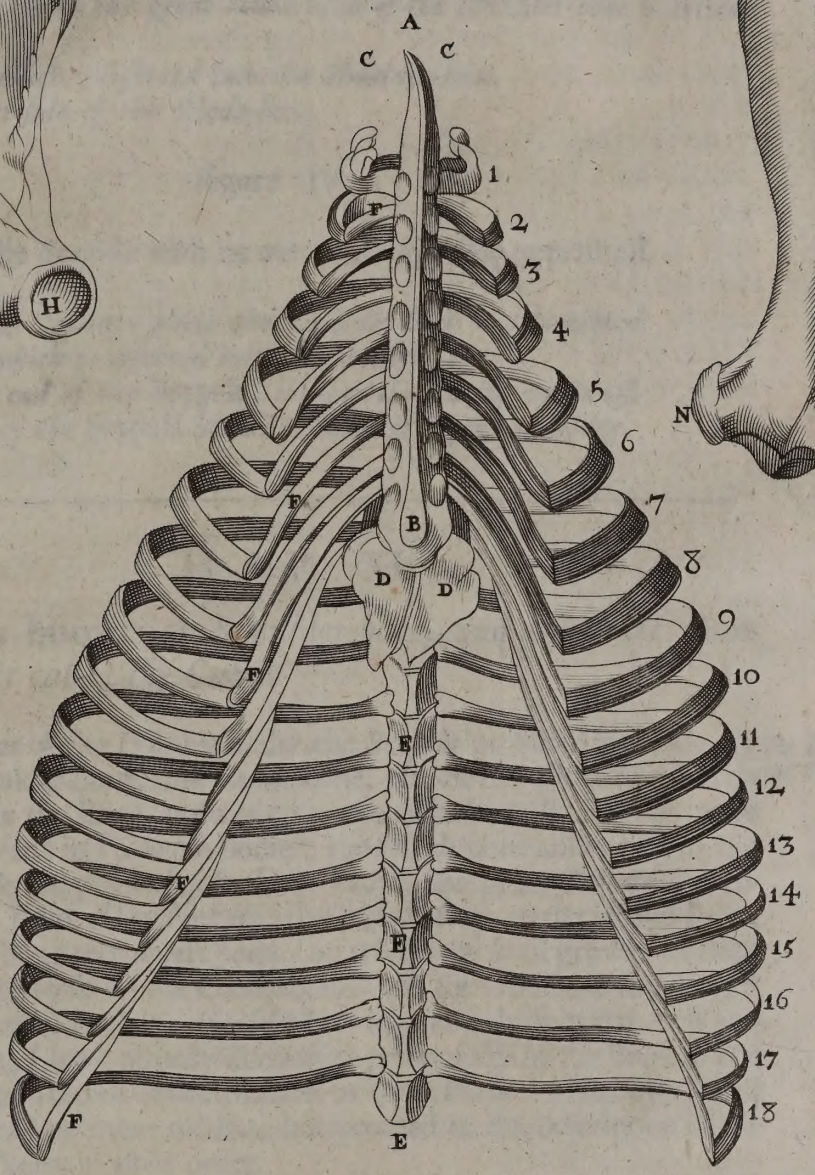
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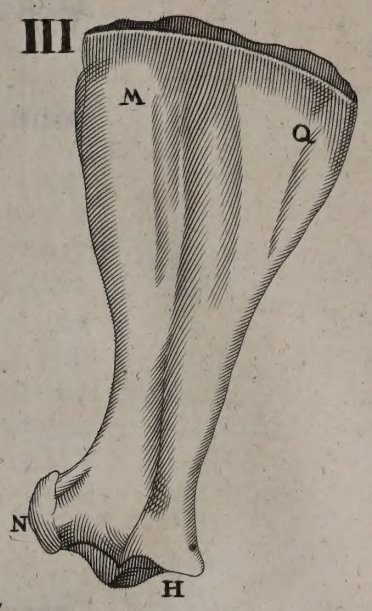
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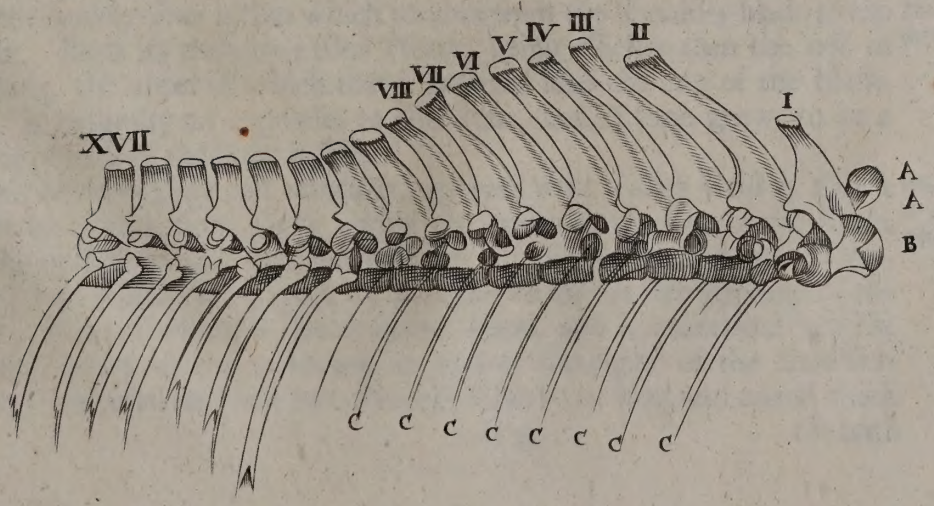
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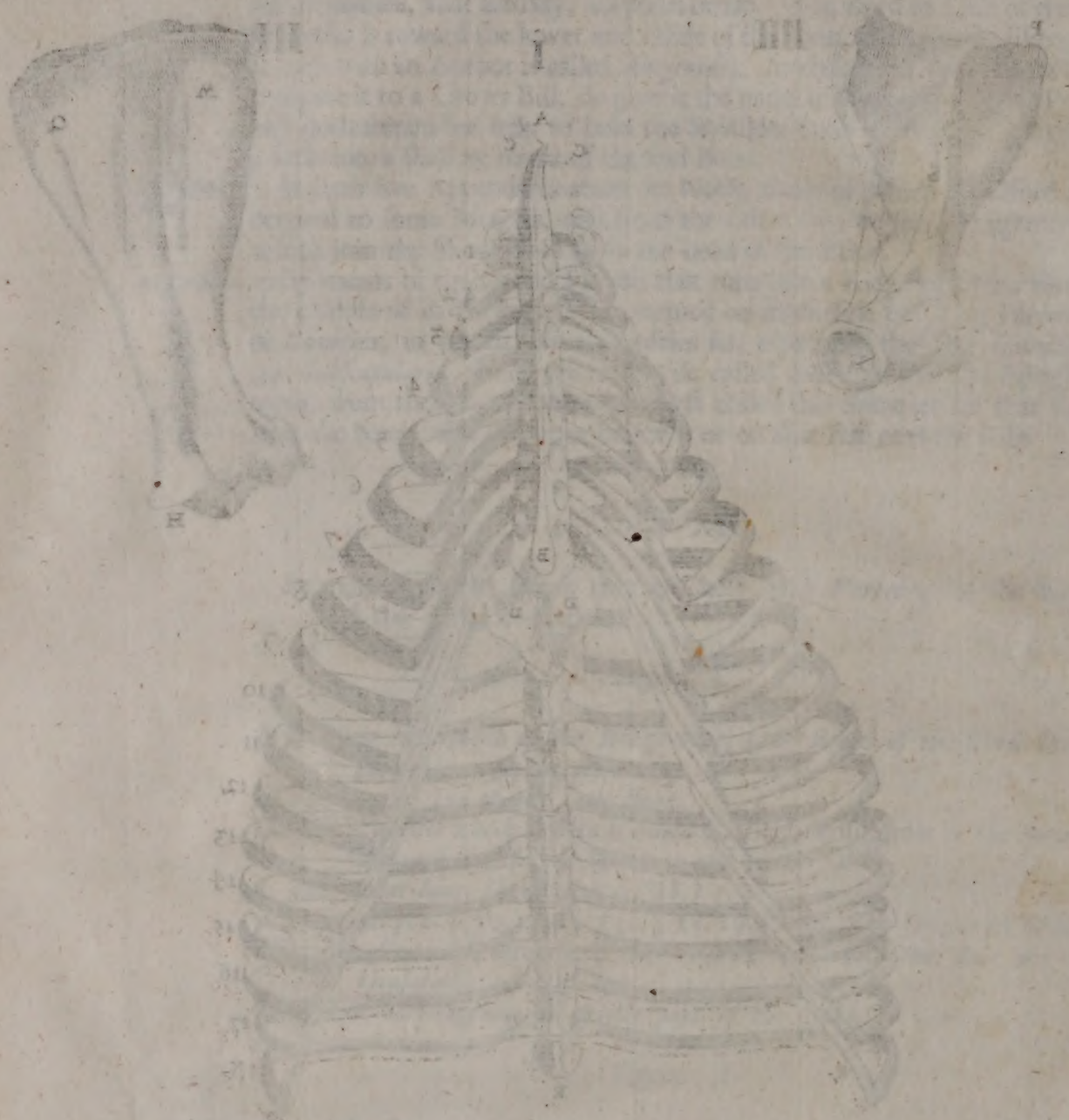

Figure III.

Shews the *Scapula* or Shoulder-blade with that ſide that is next the Body outermoſt.

H *The Cup into which the great round head of the Shoulder-bone is articulated.*
N *The Proceſs which is inſerted into the Shoulder-bone.*
M Q *The under-ſide of the Blade-bone.*

Figure IV.

Shews the *Scapula* with its outer or right ſide uppermoſt.

H *The Cavity or Cup into which the Shoulder-bone is articulated.*
N *The Proceſs which is inſerted into the Shoulder-bone.*
O P *The upper end of the* Scapula, *its Cartilage being taken off.*
S *That Proceſs of the* Scapula *which is called its Spine or Ridge.*

CHAP. XI.

Of the Os humeri *or Shoulder-bone, and the next Bone under it called the Cubit.*

THE Bones of the *Fore-leg* under the *Scapula* or Shoulder-blade are the Shoulder-bone, the Cubit-bone, the Seven Oſſelets or little Bones that make the Knee, anſwering to the eight little Bones that make the *Carpus* or Wriſt in Humane Bodies, the Shank-bone anſwering to the Bones of the *Metacarpus* or back of the Hand, the great Paſtern anſwering to the firſt Joint of the Fingers, the little Paſtern to the ſecond Joint, and the Coffin-bone to the laſt Joint, on which the Nail grows, as doth the Hoof of the Horſe on the Coffin-bone. Of the ſimilitude there is betwixt theſe ſeveral Joints in a Horſe's Fore-leg, and thoſe in the Arm and Hand of a Man, I have already diſcourſed pretty fully in the Book of the Muſcles, where I treated of the Muſcles of theſe Parts: wherefore I ſhall in this place ſpeak no more of that, but proceed to the deſcription of the before-named Bones in their order. *The Bones of the Fore-leg.*

The *Shoulder-bone* is that which reaches from the Shoulder-blade to the Elbow. Both its ends are called Heads, being thicker than the reſt of the Bone, the upper of which that is inſerted into the cup of the Blade-bone, is naturally an appendix to the Bone, but in time grows to be a part or proceſs of the Bone it ſelf. *The Shoulder-bone.*

This Head is large and orbicular, covered over with a Griſtle, that it might be turned more glibly within the cavity of the Cup of the Blade. On the outſide of this Head there bunch out two rough and uneven Proceſſes, into which two Ligaments are inſerted for the ſtrengthning of the Joint; (one of which is like a ſecond Head, and is articulated into the ſhallow cavity of the *acromium*, or end of the Spine of the Shoulder-bone;) and betwixt theſe two Proceſſes there is a long and round chink *What Bones it articulates with.*

through which the nervous Head of the Muſcle *Biceps* doth paſs. There is alſo on the inſide another round Cavity in the ſide of the Head, out of which the ſtrong Ligament ſprings that ties this Head in the cup of the *Scapula.*

The lower Head of this Bone which in Men is articulated with two Bones, *viz.* the *Ulna* and *Radius*, in a Horſe is jointed but with one, (which I call the Cubit-bone) yet is ſo jointed to that one, that it receives it and is received by it, having three Proceſſes, and two *Sinus* betwixt them, much like the ſame Proceſſes and *Sinus* in the ſame Bone of a Man.

Beſides theſe Proceſſes already mentioned, it hath on its inſide another notable one, from which ariſe the Muſcles that lie on the inſide of the Leg upon the Cubit-bone: and on its outſide it hath yet another Proceſs, but ſomething leſs than the former, from whence do ariſe the Muſcles that lie on the outſide of the Leg upon the Cubit-bone. About the middle of this Bone, on its inſide, may be perceived a hole, through which both Veins and Arteries paſs to the Marrow contained in this Bone, for its nouriſhment.

The Cubit-bone, its Articulations.

The next part of the Leg is called the *Cubit*, conſiſting, as hath been ſaid, in Men of two Bones, but in a Horſe onely of one: The two Bones in Men reach from the Elbow to the Wriſt; and this one in Horſes from the Elbow to that Joint commonly called the Knee, but which might properly enough have the ſame name as in Men, ſeeing it is of a like fabrick. This Cubit-bone in its hinder and upper part hath a notable Proceſs, long and round, onely ſomething flattiſh, which entreth into the larger *Sinus* or Cavity of the lower Head of the Shoulder-bone, and maketh that bunching-out which we call the Elbow. This Proceſs is ſomething rough and uneven, partly that the Ligaments might be the more ſtrongly knit to it that encompaſs the Joint; and partly for the inſertion of ſome Muſcles of the Cubit, as alſo to give original unto the Muſcles that bend the lower part of the Leg and Foot; for which cauſe alſo the Bone it ſelf is rough at the root of the Proceſs. The circumference of the *Sinus* into which it is inſerted, is alſo rough, that from thence Ligaments might iſſue. Its leſſer and inner Proceſs is received by the leſſer *Sinus* of the Head of the Shoulder-bone. There are three cavities in this upper Head, for the reception of as many Proceſſes of the lower end of the Shoulder-bone. Its lower end articulates with the three upper little Bones of the Knee (that make the firſt range) as ſhall be ſhewed in the next Chapter.

CHAP.

CHAP. XII.

Of the ſeven Oſſeletts or little Bones of the Knee, of the Shank-bones which reach from the Knee to the great Paſtern, and alſo of the two Paſtern-bones and the Coffin-bone.

BEtween the Cubit-bone and the Shank-bone there are two ranges of little Bones, one above another, being in number ſeven, that is to ſay, three in the firſt and four in the ſecond range: all which are joined one to another ſo firmly, that they are not eaſily to be ſeparated. The upper range are articulated with the lower end of the Cubit-bone, and the lower range with the upper end of the Shank-bone. *The number of the little Bones of the Knee.*

Theſe Bones do differ one from another in their magnitude, form and ſituation, and are ſaid in their firſt generation to be all Griſtles and not Bones, but in proceſs of time they become hard and grow bony. Their ſubſtance is ſpongy, as are all the reſt of the Bones which of Griſtles become bony, of which kind are all the Appendices of Bones, the Bones of the Breaſt and ſuch like. They are all covered over with both a membranous and griſtly Ligament, whereby they are ſo compacted together, that without dividing the ſaid Ligaments, and ſeparating the Membranes or Skins, it is a hard matter to diſtinguiſh them one from another, ſo that at the firſt view they may be thought to be all of them but one Bone.

They have a double *Superficies*, one outer, which is gibbous or bunching, and another inward which is concavous or hollow; and in their upper part where they join to the Cubit-bone, they are ſmooth and cruſted over with the before-mentioned Griſtle.

Theſe Bones I will not undertake to give proper names to, but ſhall diſtinguiſh them by their order and number, calling that the *firſt* that is placed on the inſide of the *upper* rank. This is ſomething longiſh and curved inward, articulated with the Cubit-bone above, and below with the ſecond Bone of the lower rank, yea it toucheth both the third and fourth of the ſame rank. Its inſide joineth cloſely to the inſide of the ſecond Bone of its own rank. *The upper rank.*

The *ſecond* of theſe Bones is cloſe knit to the former, being ſomething leſs than it. It is joined to the Cubit-bone in its upper part, which part is hollowed to receive the Appendix of the ſaid Bone. It is alſo joined with the firſt Bone by one ſide, and by the other or rather hinder part to the third Bone, and laſtly by its bottom to the ſeventh Bone or fourth of the lower rank.

The *third* is alſo joined above with a plain Superficies to the Cubit-bone, by its inſide to the ſecond Bone of its own rank, and by its lower part to the fourth Bone of the next rank.

The *fourth* Bone or *firſt* of the *lower* rank, is ſomething ſmaller than any of the before-mentioned three, and is in ſhape almoſt round. It is ſmooth, not being hollow nor protuberated as the reſt are. It is joined *The lower.*

above to the outſide of the lower-part of the firſt Bone, below to the Shank-bone, and on its inſide to the fifth Bone or ſecond of its own rank.

The fifth (or *ſecond* of the lower rank) hath ſeveral little *Sinus's*; It hath one notable one above into which the firſt Bone of the upper rank is articulated, and another below for the reception of part of the Head of the Shank-bone.

The ſixth (or *third* of the lower rank) is joined with a plain Superficies on each ſide to the ſeventh (or *fourth*) and to the foregoing; above, to the ſecond, and below to the Shank-bone.

The ſeventh (or *fourth* of the lower rank) is not much unlike the former, on its inſide being joined to the foregoing, on its upper ſide to the third of the upper rank, and on its lower to the head or top of the Shank-bone.

The Shank-bone, its Articulation. The next part of the Leg which anſwers to the *After-wriſt* or back of the Hand in a Man, is made of three Bones, one of which is long and round and much larger than the other two. It reaches from the Knee to the great Paſtern, being articulated above with every one of the lower rank of the little Bones of the Knee; and below it is joined to the great Paſtern by a mutual articulation, having two round heads and three ſmall Cavities at that end of it for that purpoſe. This we call the *Shank-bone.*

The Splent-bones. To each ſide of this Bone is faſtned another long thin Bone, in figure ſomething like a Bodkin, being ſomewhat thick and round at their upper part, and from thence as they run down towards the Foot, becoming thinner and ſharper, till at laſt they end in a ſharp point, a little above the joining of the Shank-bone with the great Paſtern. Between theſe two Bones do run the Tendons of the Muſcles that move the Foot, as they deſcend down the Shank-bone. Theſe two we may call the *Splent-bones*, ſtanding on each ſide of the Shank-bone like two Splents, ſuch as Bone-ſetters uſe for broken Bones.

The next is the Bone which anſwereth to the firſt joint of the Fingers in Man, in whom they are five in number, by the wonderfull wiſedom of the Creator ſo ordained as was fitteſt for that variety of motions to which they are deſign'd. But an Horſe being *Solidipes* or a whole-footed Creature, hath all his Foot neceſſarily moved together, and the Bones thereof in each Joint being ſingle, anſwer but to the Bones of one Finger.

The great Paſtern. The form of this Bone, which is called the *great Paſtern*, is gibbous and crooked. At its top, where it is articulated with the Shank-bone, it has three ſmall Proceſſes and two Cavities betwixt them: alſo two ſmall triangular Bones faſtned to its back-part. Its outſide is plain and ſmooth, and without any roughneſs at all. Its lower end conſiſts of two heads which are round and bunching and are articulated into the *Sinus* of the *leſſer Paſtern* which is under it.

The little Paſtern. The next is the *little Paſtern*, anſwering to the ſecond Joint of the Fingers. This is not much unlike the former, onely it differs in the length, for it is not much above half ſo long. Its upper end (as was ſaid) is articulated with the great Paſtern, and its lower end is received by the Coffin-bone in the ſame manner as it ſelf received the lower end of the great Paſtern by its own upper end.

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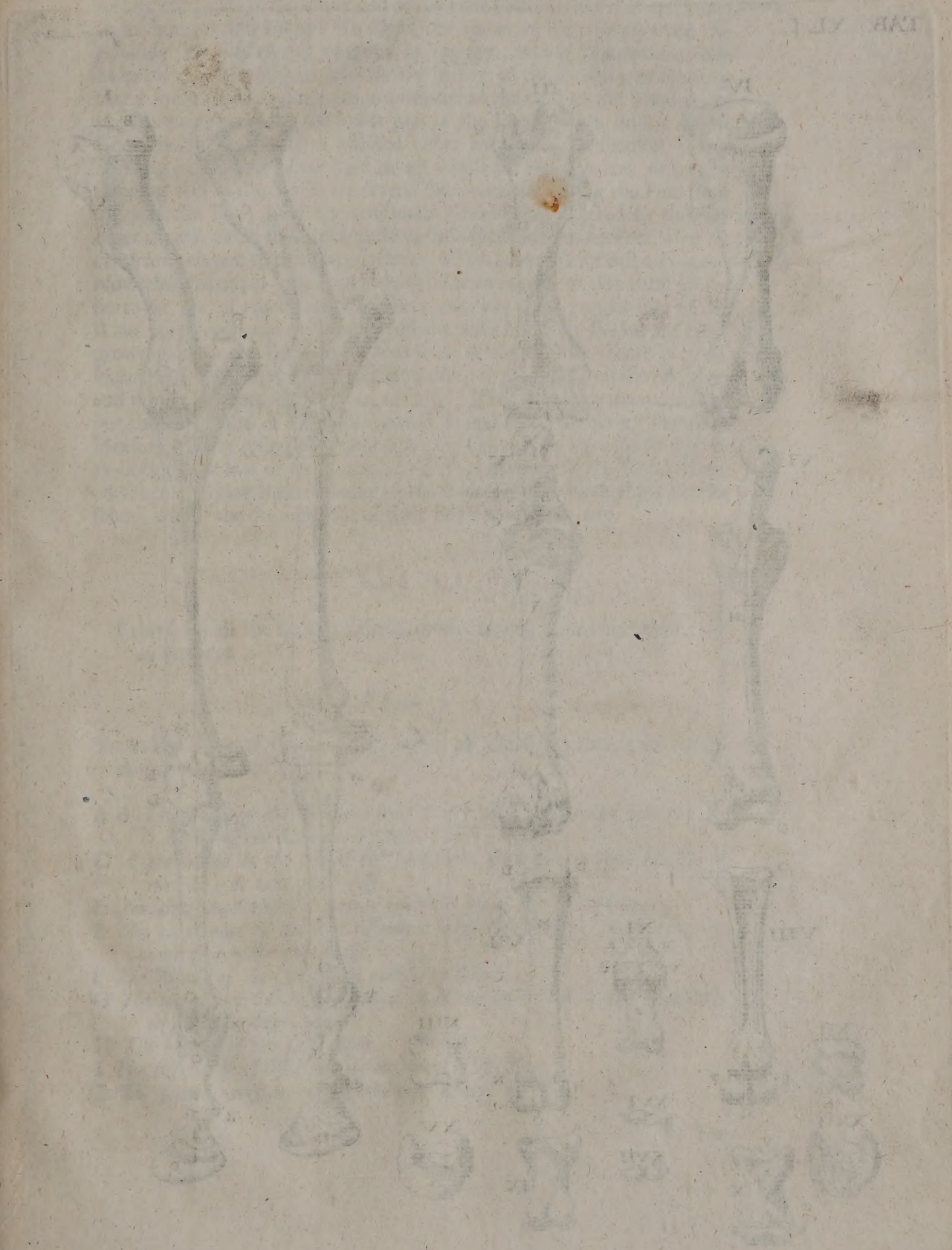

TAB. XLI.

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The next and laſt Bone of the Foot is the *Coffin-bone*, ſo called (I ſuppoſe) from its hollowneſs on its under-ſide. Its *figure* is ſemilunary or Half-moon-faſhioned. It is thick at its top, (where it has cavities to receive the heads of the lower end of the little Paſtern) but thin and broad at its bottom and toward its edges, for its more firm fixing upon the ground. Its *ſubſtance* is ſungous or ſpongy, having innumerable little holes piercing through its ſides for the paſſage of the Veſſels; as alſo very many ſmall *Sinus's* whereinto are implanted the ends of the Tendons of the Muſcles that move the lower part of the Leg, and the Foot: whoſe Fibres being at any time affected either by bruiſes, ill ſhooing, or by ſtanding in the water after hard riding whilſt the Horſe is hot, or but by ſtanding ſtill in the Stable for ſeveral days without having the Feet ſtopt up, and the like; I ſay the tendinous Fibres being affected by theſe or other means, cauſe the Horſe to have ſuch great pain in his Feet, that he can ſcarce endure to tread upon them; which lameneſs we call a *Founder*. Now this diſtemper is ſo much the harder to cure by reaſon theſe Fibres lie ſo far out of reach, moſt of them running on the upper ſide of the Bone (betwixt it and the Hoof) and not to its bottom; ſo that the Hoof growing upon the ſides as the Soal doth at the bottom, there is great hazard but we ſhall miſs of effecting a cure, if we onely pull the Soal out, and do not cut part of the Hoof off alſo. This is not my bare opinion, but the experience of thoſe that have had good ſucceſs in curing foundred Horſes, who by raſing the Hoof from the Coronet or top of it to the very bottom, in five or ſix places, untill they have made the Bloud come, and then applying their remedies to thoſe places, have made thoſe Horſes ſound, whom the drawing out of their Soals would not cure.

The Coffin-bone. Its figure, ſubſtance and Sinus's.

The cauſe and cure of a Founder.

Table XLI.

Repreſents all the Bones of the Fore-legs as well joined one to another as ſeparate.

Figure I.

Shews the Bones of the near Leg before, all joined together, (the Blade-bone being taken off.)

A B *The heads of the Shoulder-bone which were articulated into the cavities of the Shoulder-blade.*
C *A production in the ſide of the ſaid Bone, from whence ſome Muſcles of the Leg do take their riſe.*
D *Its lower head which is jointed with the top of the Cubit-bone.*
E *The outer part of the firſt Oſſelet or little Bone of the upper range or rank that make the Knee.*
F *The Proceſs of the Cubit-bone called the Elbow.*
G *The top of the Cubit-bone joined with the lower end of the* Humerus *or Shoulder-bone.*
H *The bottom of the ſaid Bone.*
I *The firſt range of Oſſelets or little Bones of the Knee.*
L *The ſecond range or rank of the ſaid Bones.*

M *The*

M *The little Bodkin-like (or Splent-) Bones on each ſide of the Shank-bone.*
N *The top of the Shank-bone, where it is articulated into the ſecond range of the little Bones of the Knee.*
O *The bottom or lower end of the ſaid Shank-bone.*
Q *The great Paſtern.*
Y *The two little triangular Bones which are joined to the back-part of the great Paſtern near the top of it.*
R *The little Paſtern.*
T *The Coffin-bone.*

Figure II.

Shews the Bones of the Off-leg or right Leg, all of them *in ſitu.*

A B *The heads of the Shoulder-bone that articulate with the* Scapula.
C *The production in the ſide of the ſaid Bone.*
D *Its lower head with which the Cubit-bone is articulated.*
E *The firſt Oſſelet of the firſt range of the Knee.*
F *The production of the Cubit-bone called the Elbow.*
G *The top or head of the Cubit-bone.*
H *The bottom or lower end of the ſaid Bone.*
I *The firſt range of the little Bones of the Knee.*
L *The ſecond range of the ſaid Bones.*
M *The Bodkin-like (or Splent-) bone that is on the ſide of the Shank-bone.*
N *The top of the Shank-bone.*
O *The lower end of the ſaid Bone.*
P *The great Paſtern.*
S *The little Paſtern.*
Y *The two little triangular Bones faſtned to the top of the great Paſtern-bone.*
V *The Coffin-bone.*

Figure III.

Shews the fore-part of the Shoulder-bone ſeparated from the other Bones.

A N *The heads of the Shoulder-bone that are articulated with the* Scapula.
B *The production in the ſide of the ſame Bone.*
E *The heads at the bottom of the ſaid Bone, which are articulated into the cavities of the upper end of the Cubit-bone.*
D *The cavity into which the long production of the Cubit-bone is articulated.*
OO *The body of the Shoulder-bone.*

Figure

Figure IV.

Shews the hinder-part of the Shoulder-bone by it ſelf.

A *The great round head at the top of the Shoulder-bone.*
B *The great production of the ſame Bone.*
CD *The diviſion of the head at the lower end of the Shoulder-bone.*
O *The little eminence in the ſide of the ſaid Bone.*

Figure V.

Shews the fore-ſide of the Cubit-bone.

A *The top of the long production at the upper end of the Cubit-bone, called the Elbow.*
B *The middle of the ſaid production.*
C *The cavities at the upper end of the Cubit-bone, into which the lower heads of the Shoulder-bone are articulated.*
G *The body of the Cubit-bone.*
PH *The round heads at the bottom of the Cubit-bone.*

Figure VI.

Shews the back-ſide of the Cubit-bone.

A *The top of the long production of the Cubit-bone.*
BB *The upper heads of the ſaid Bone which are articulated with the lower end of the Shoulder-bone.*
CC *The lower heads of the ſaid Bone which do articulate with the upper range of little Bones of the Knee.*
F *A cavity of the lower end of the ſaid Bone, into which one of the little Bones of the upper range doth articulate.*
H *The body of the ſaid Bone.*

Figure VII.

Shews the fore-ſide of the Shank-bone.

DD *The upper head of the ſaid Bone, as alſo of the two Bodkin-like Bones on each ſide of it, where they were articulated with the lower range of the little Bones of the Knee.*
C *The two lower heads of the ſaid Bone, whereby it was articulated into the cavities of the upper part of the great Paſtern.*
M *The body of the ſaid Bone.*
NN *The two cavities or dens at the ſides of the lower heads of this Bone, into which cavities the heads of the great Paſtern were implanted or articulated.*

Figure

Figure VIII.

Shews the back-ſide or hinder-part of the Shank-bone, on which the back Sinews lie.

OO *The heads of the Shank-bone and of the two Bodkin-like Bones on each ſide of it.*
PP *The two heads at the lower end of this Bone which were articulated with the great Paſtern.*
C *The cavity between theſe two heads, in which is articulated a Proceſs of the upper end of the great Paſtern.*

Figure IX.

Shews the fore-part of the great Paſtern.

A *The dens or cavities in its upper part which receive the heads of the lower end of the Shank-bone.*
B *The heads at the lower end of this Bone which were articulated into the* Sinus *or cavities of the upper end of the little Paſtern.*

Figure X.

Shews the back-part of the great Paſtern.

A *The* Sinus *or cavity into which the heads of the two little triangular Bones were articulated.*
BB *The two heads at the lower end of the great Paſtern, which were joined with the little Paſtern.*
V *The cavities at the upper end of this Bone which did receive the heads of the lower end of the Shank-bone.*

Figure XI.

Shews the fore-part of the great Paſtern with the two triangular Bones faſtned to the back-part of it.

RR *The two triangular little Bones.*
VV *The cavities into which the two heads of the lower end of the Shank-bone were articulated.*
Z *The body of the great Paſtern.*

Figure XII.

Shews the little Paſtern on its fore-ſide.

Figure XIII.

Shews the back-ſide of the little Paſtern.

Figure

Figure XIV.

Shews the bottom of the Coffin-bone.

Q *The circumference of the ſaid Bone which gives the round ſhape to the Foot.*

S *The cavities or hollowneſſes whereinto the heads of the little Paſtern were articulated.*

Figure XV.

Shews the ſides and top of the Coffin-bone.

A *Shews all the outſide of the ſaid Bone.*

Figure XVI.

Shews the fore-ſide of the two little triangular Bones ſeparated from the upper part of the great Paſtern-bone.

Figure XVII.

Shews the back-ſide of the ſaid Bones.

CHAP. XIII.

Of the Os ſacrum *or holy Bone, together with the* Coccyges *or Rump-bones, otherwiſe called the Bones of the Dock or Tail.*

THE *Os ſacrum* or holy Bone, is ſeated at the lower end of the Back, at the end of the *Vertebræ* of the Loins, to the laſt of which one end of it is articulated, and the other end to the firſt of the Bones of the Dock or Rump-bones. It is much the broadeſt and largeſt of all the Bones of the Back. Its *figure* is almoſt triangular, having a broad beginning, and ending by degrees into a narrowneſs. On the inſide it is ſmooth and hollow, but ſomething unequal; behind or on its outſide it is gibbous and alſo rough, becauſe of the Muſcles of the Back and their Ligaments cleaving unto it. Its *acute* Proceſſes or Spines are very ſmall; and the *tranſverſe* ones but obſcure: as for the *oblique*, there is no appearance of *them*, ſave in the firſt *Vertebra*. On its outer ſide near its edges there are certain *Sinus's* or hollowneſſes, to which the Haunch-bones do cleave firmly by an intervening Cartilage. *Os ſacrum, its ſeat, connexion, figure and ſurface.*

Its *Vertebræ* are in number ſix, whoſe Spines are much leſs than the Spines of the *Vertebræ* of the Loins, and the lower or nearer to the Rump-bones, the leſſer they are ſtill. *Its Vertebræ.*

This holy Bone is perforated in ſeveral places; as firſt, quite through its length it hath a large hole or cavity to receive the Spinal Marrow; out from which there go many other leſſer for the egreſs of the Nerves; *Its Holes.*

and theſe are not in the ſides of the *Vertebræ* as thoſe are that be in the *Vertebræ* of the Neck, Back and Loins, but on the inſide and outſide or and above, of which thoſe below are much the larger.

The Rump-bones.

To this Bone at its lower end are joined the *Rump-bones*, which in this Animal we are treating of are in number eighteen. Theſe are joined to each other by a Cartilage or Griſtle, but ſo looſely, that the Horſe can bend his Rump which way he will. Thoſe of theſe Bones that are next to the holy Bone, are ſomething thicker and broader, than thoſe further from it; for as they deſcend down, they each grow leſs and leſs, ſo that the loweſt grows into a cartilaginous or griſtly point, as you may ſee in the figure of the Skeleton, where they are all lively repreſented *in ſitu*. Theſe Bones are not ſo hard as moſt of the other Bones are, but more ſoft and ſpongy; neither have they any Proceſs, or any hollowneſs, except the firſt of them, which hath a ſmall cavity or den to receive the laſt *Vertebra* of the *Os ſacrum*, which *Vertebra*, is the furtheſt part whither the Spinal Marrow reaches.

Table XLII.

Repreſents the *Os ſacrum* and Rump-bones joined together; alſo the *Os ſacrum* joined with the *Vertebræ* of the Loins; and ſeveral other figures of theſe Bones.

Figure IV. and V.

Shew the *Vertebræ* of the Loins joined with the upper end of *Os ſacrum*.

1. 2. 3. 4. 5. 6. 7. *Shew the ſeven Spines or backward Proceſſes of the* Vertebræ *of the Loins.*

1. 2. 3. 4. 5. 6. *The ſix Spines of the holy Bone.*

1. 2. 3. 4. 5. *Holes in the* Os ſacrum *for the egreſs of the Nerves from the Spinal Marrow out of that Bone.*

G *The hole of* Os ſacrum *which contains the Spinal Marrow.*

DDD *The long and flat Productions or tranſverſe Proceſſes at the ſides of the* Vertebræ *of the Loins.*

VVV *The little Productions in the ſides of the* Vertebræ *of the Loins whereby they are articulated into each other.*

Figure VI.

Shews the laſt *Vertebra* of the Loins removed from the reſt and turned on one ſide.

Figure VII.

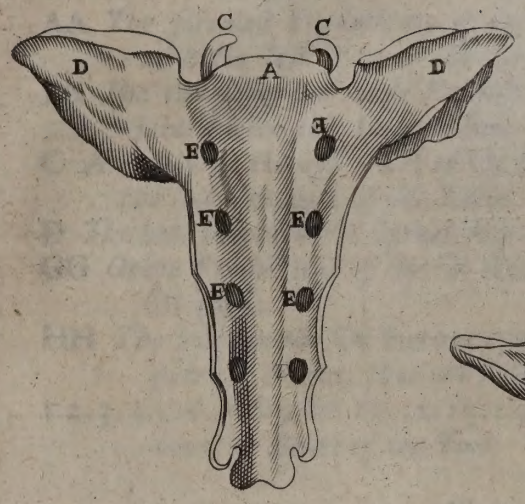
Shews the laſt *Vertebra* of the Loins with that ſide forwards whereby it was join'd with the laſt but one, in which *Vertebra* is to be ſeen the hole where the Spinal Marrow did paſs through it.

Figure VIII.

Shews the ſame Bone with that ſide uppermoſt that reſpects the cavity of the Body.

Figure

XI



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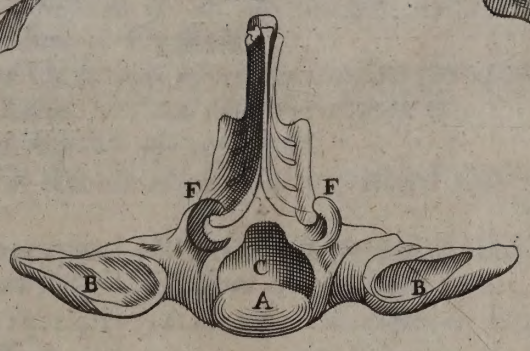

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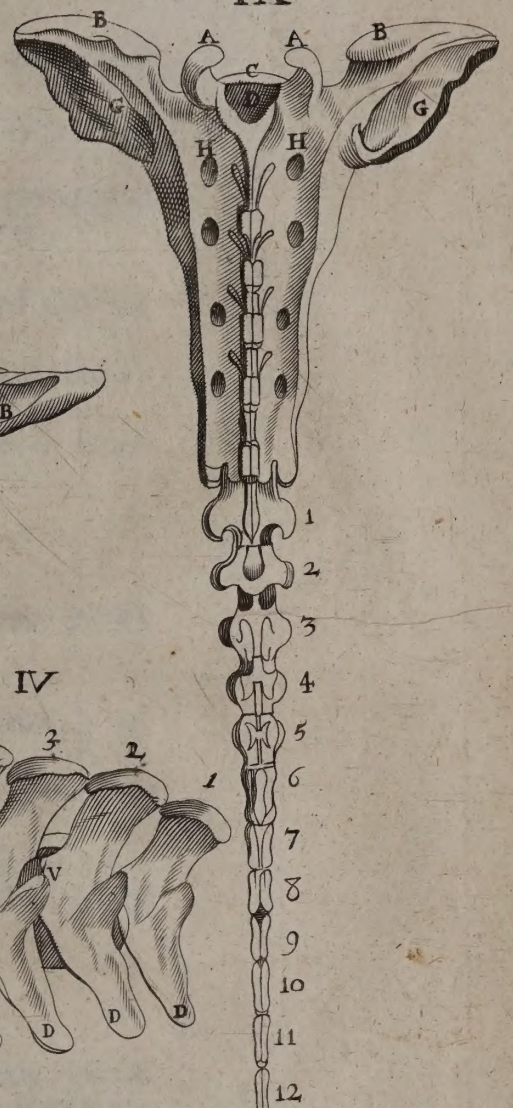

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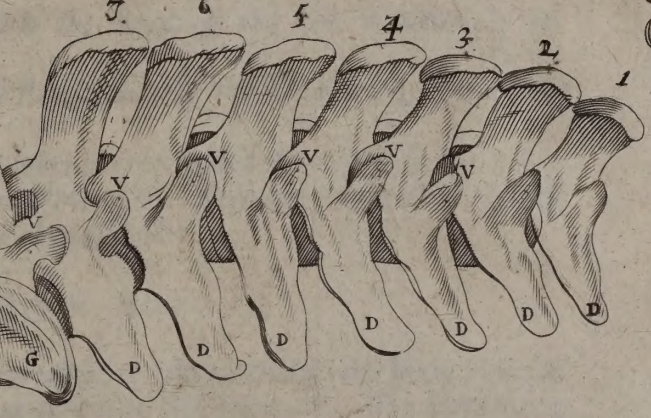

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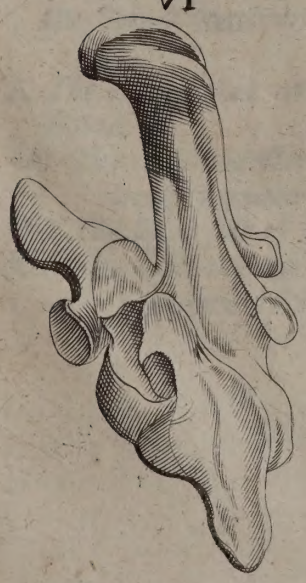

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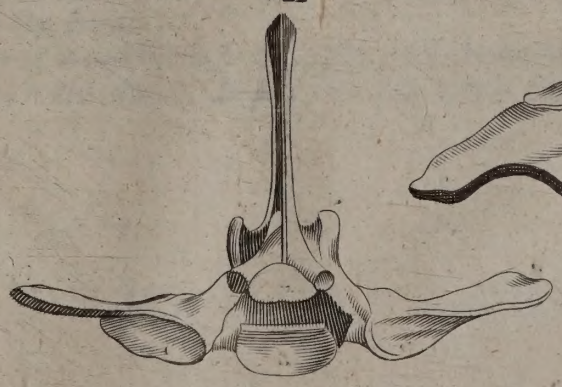

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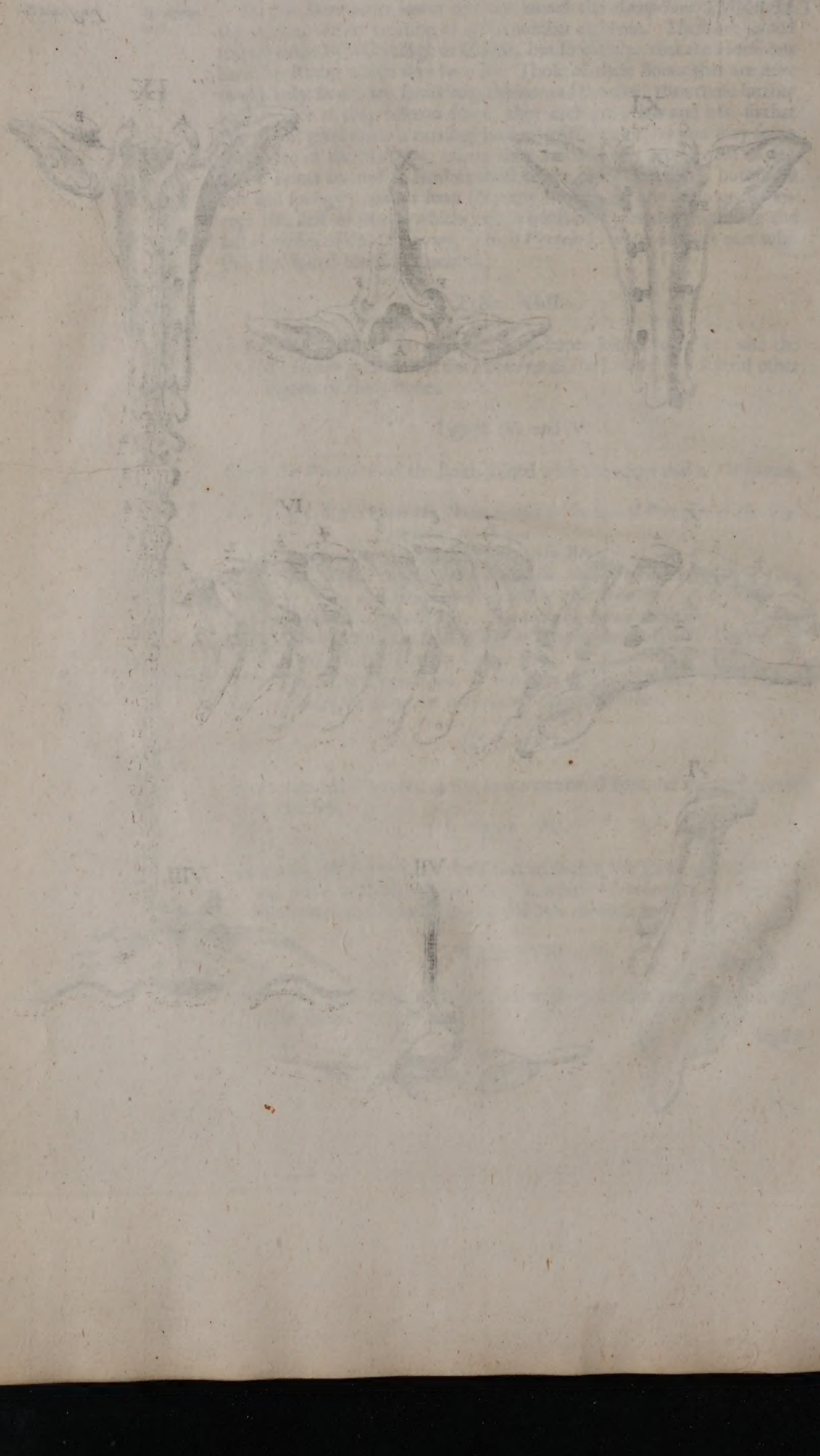

Figure IX.

Shews the lower ſide or inſide of *Os ſacrum*, as alſo the Rump-bones joined to it.

AA *The foremoſt Productions of the ſaid Bone, which were articulated with the laſt Bone of the Loins.*
BB *The two long and wide Productions of the* Os ſacrum, *which were joined with the Haunch-bone or* Os ilium.
C *A cavity at the upper end of* Os ſacrum *which did receive the head of the laſt* Vertebra *of the Loins, and was articulated with it.*
D *The hole in which the Spinal Marrow was contained.*
GG *Other Productions of the* Os ſacrum *which were articulated with the* Os pubis.
HH *The holes in the* Os ſacrum *out of which did paſs the conjugations or pairs of Nerves that are diſtributed about all the hinder parts.*
1.2.3.4.5.6.7.8.9.10.11.12.13.14.15.16.17.18. *The eighteen Rump-bones or Bones of the Tail.*

Figure X.

Repreſents the upper part of *Os ſacrum* that joins to the Loins, as alſo partly its inſide turned upward.

A *The round cavity into which the head of the laſt* Vertebra *is articulated.*
BB *The lower ſide of the broad Productions of the* Os ſacrum, *which join with the* Os ilium.
C *The cavity in the ſaid Bone wherein the Spinal Marrow is contained.*
FF *The two little foremoſt Productions with which the hindmoſt of the laſt* Vertebra *of the Loins are articulated.*

Figure XI.

Shews that ſide of the *Os ſacrum* which looks to within the Body, as alſo its ſeveral perforations through which the Nerves do iſſue forth from the Spinal Marrow.

A *The cavity that receives the round head of the laſt* Vertebra *of the Loins.*
CC *The two Productions that are articulated with the hinder ones of the loweſt* Vertebra *of the Loins.*
DD *The lower ſide of the two broad Productions of the ſaid* Os ſacrum.
EEE *Its holes through which the Nerves do paſs from the Spinal Marrow contained in it.*

CHAP. XIV.

Of the nameleſs Bone, commonly divided into the Hip, Haunch and Share-bones.

Os innominatum. *or nameleſs Bone.*

THE *Hip-bone* (commonly ſo called) is by Anatomiſts divided into three parts. Firſt, *Os ilium*, ſo named becauſe the Gut *Ilium* lieth under it. The next is called *Os coxendicis*, or *Iſchium*, which is the lower and outer part of the nameleſs Bone, (or *Os innominatum*) which is the name of theſe three Bones as joined all together, for they are truly but one Bone in old Horſes, though in Colts they are divided one from another by Cartilages, from whence this diſtinction is made, and they come to be diſcourſed of by three ſeveral names. The third part of this Bone is called *Os pubis*, alſo *Pectinis*, or the Share-bone.

Os ilium *or Haunch-bone.*

That part that is called *Os ilium*, is the uppermoſt and broadeſt, which is joined to the holy Bone. In figure it is ſemicircular, and its ſemicircular circumference is called its Spine. On its outſide it is ſomething arched, but within hollow; the arched part is called *dorſum*, its Back, the hollow part *coſta*, or its Rib.

Its Spine.

That part which is called its *Spine*, is in many places unequal, that ſome Muſcles might take their original from it, *viz.* the Oblique aſcendent Muſcle of the *Abdomen* or Paunch, the *Deltoides* of the Thigh, the firſt Extender of the Leg called *Membranoſus*, &c. And on the back of this Bone there are unequal inſcriptions or lines for the riſe of the three Muſcles of the Thigh that help to make the Buttocks (called *Glutæi*;) and alſo for other Muſcles that lie under theſe.

Coxendix *or Hip-bone.*

The ſecond of the parts of this nameleſs Bone is called *Os coxendicis*. This is the lower and outer part of it, in which there is a great *Sinus*, called *Acetabulum*, the Cup or Sawcer, into which the head of the Thigh-bone is exceeding ſtrongly articulated. This Cup has its edges environed with a Griſtle, called *Supercilium*, its brow; in whoſe circumference there are obſerved three *Sinus*, two Protuberations and an acute Proceſs, and laſtly an Appendix that is very thick: all which were ordained for the production partly of Ligaments and partly of Muſcles.

Os pubis *or Share-bone.*

The third and laſt part of this nameleſs Bone is called *Os pubis*, or the Share-bone. This is originally two Bones, parted one from another in the middle with a Griſtle, but in continuance of time the Griſtle it ſelf becomes bony, and ſo unites them into one Bone. It is placed at the bottom of the Paunch, betwixt the two hinder Legs as the Horſe ſtands. On its outſide it has on each ſide a *Sinus* for the deſcent of the crural Veſſels. On the ſame ſide alſo it is rough to give the firmer original to the ſtreight Muſcles of the *Abdomen* and to the ſecond Bender of the Leg. It is but a thin Bone, being hollow within, and perforated with the greateſt hole of any ſuch-like Bone in the whole Body. On its hinder and inner ſide it has two Proceſſes, from whence the nervous bodies of the Yard, and ſome Muſcles take their original.

Pelvis *or the Baſon.*

Theſe Bones with the holy Bone do make that cavity which is called *the Baſon*, which is the place wherein are contained part of the Guts, and the Bladder in a Horſe; and in a Mare part of the Guts, the Bladder and the Womb.

Table

TAB. XL III.

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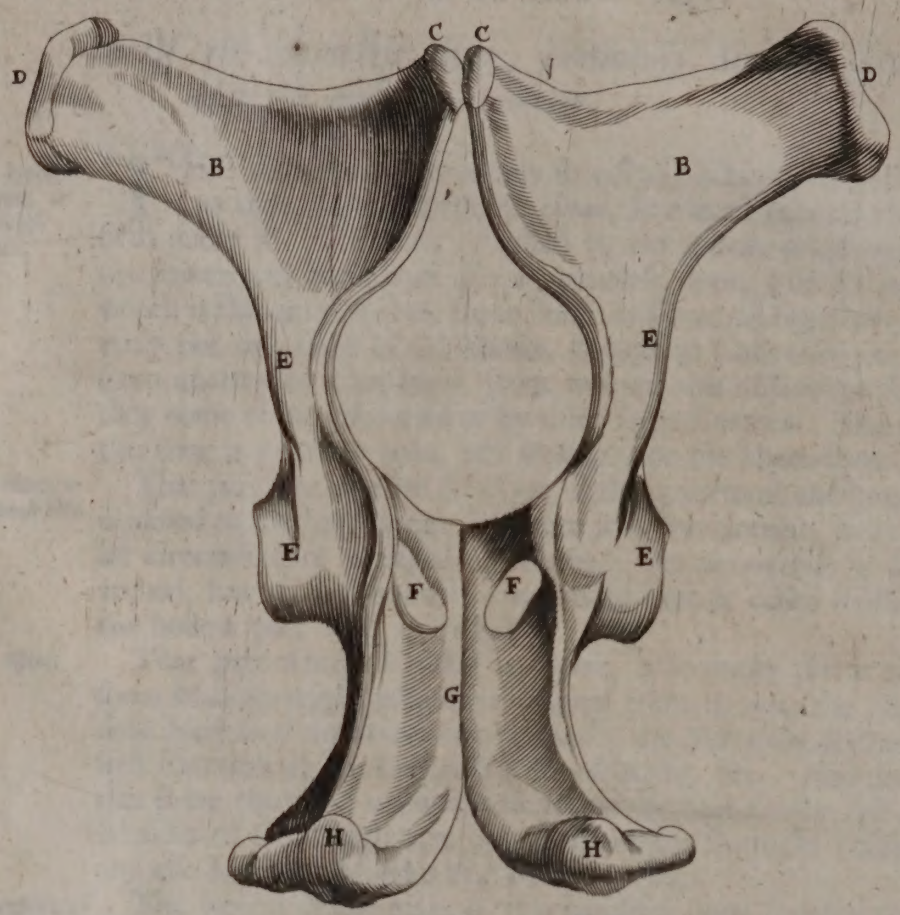

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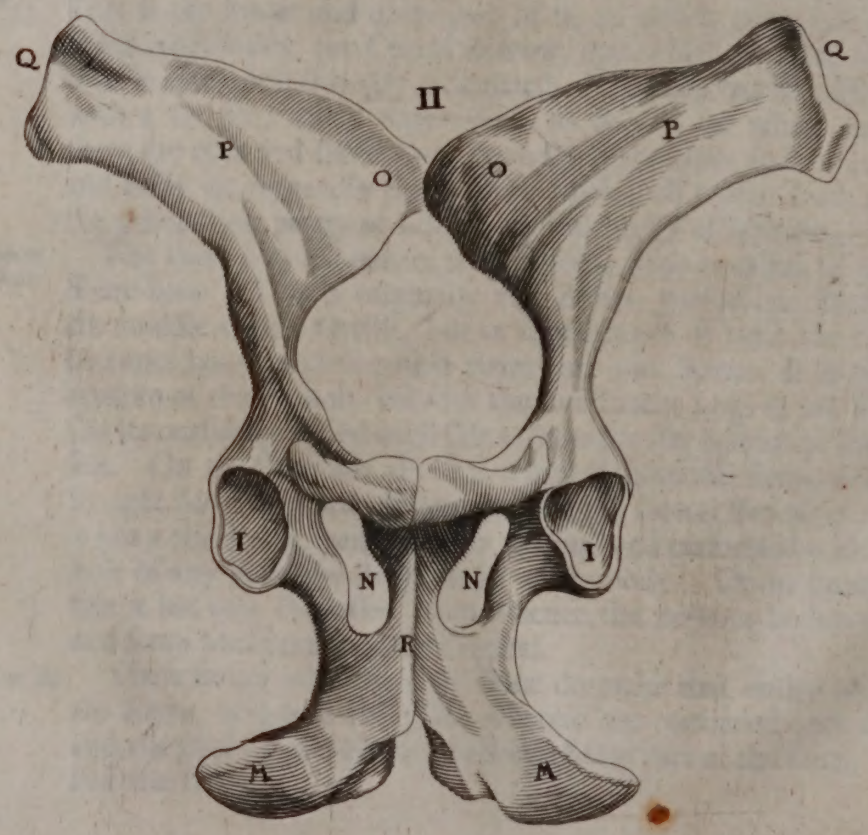

Table XLIII.

Repreſents the three Bones that make the *Os innominatum* or nameleſs Bone.

Figure I.

Shews the ſaid Bone with the right ſide upward.

BB *Shew the upper part of* Os ilium.
CC *The two Productions of the ſaid Bone which are faſtened by very ſtrong Ligaments to the Proceſſes of* Os ſacrum.
DD *The Spines or Ridges of the ſaid Bone.*
EEEE *The* Os coxendicis *or lower and outer part of the nameleſs Bone.*
FF *The two holes in the* Os pubis *or Share-bone made for the ingate and outgate of Veſſels.*
G *The Seam which divides the Share-bone in the middle.*
HH *The extremities or ends of the ſaid Bone.*

Figure II.

Shews the *Os innominatum* turned the upſide downward.

II *Shew the Cup of the* Os coxendicis, *into which the head of the Thigh-bone is inſerted.*
MM *The extremities or ends of the Share-bone.*
NN *The two large holes in the bottom of the ſaid Bone.*
OO PP *The inſide of* Os ilium.
QQ *The Spines or Ridges of the ſaid Bone.*
R *The Seam of the Share-bone which divides it into two parts.*

CHAP. XV.

Of the Thigh-bone and Patella *or little Bone of the Stifle.*

THE *Thigh* is called by the Latins *Femur à ferendo* to bear, becauſe the Creature is born up or ſuſtained by it. This Bone (like the Bone of the Shoulder) is but one, reaching from the Hip-bone to the Stifle. The *figure* of it is long, round and ſtreight, except where its Heads and Protuberances bunch out; of which it hath, above, one Head, one Neck, and two Proceſſes; and below, it determins into a Head which hath two Productions and a Cavity between them. *The Thigh-bone.*

The *upper Head* is an orbicular Appendix ſtanding upon the Neck, and is the thickeſt and largeſt Head of any Bone in the whole Body. It is round and long the better to enter into the Cup of the Hip-bone, which is not onely deep of it ſelf, but rendred deeper by a large Griſtle that compaſſeth the edges thereof. For it was neceſſary that a very firm articulation ſhould be in this place, becauſe of the huge weight which the Thigh was to ſuſtain. And beſides, to ſtrengthen it the more, and to faſten the *Its upper Head.*

two

two Bones the firmer together, there ariſeth out of the Cup of the Hip-bone an exceeding ſtrong and round Ligament, which is implanted into a little *Sinus* that is in the Head of the Thigh-bone. This Head is ſmooth and cruſted over with a Griſtle, that it might move the more glibly within the Cup.

Its Neck. The ſlender part under this Head is called the *Neck* of the Thigh-bone. This is pretty long and oblique, reaching upward but inclining inward, and is a Proceſs of the Bone. At its lower end, where the Bone grows broader, do ariſe two other Proceſſes, called Trochanters or *Rotatores*, from the Muſcles of that name that are inſerted into them. The upper of theſe Proceſſes is greater than the lower, nay greater indeed than any Proceſs in the whole Body which is not joined to another Bone; It bends upward and outward; but the other which is much leſs than this, bendeth backward and ſomewhat inward.

Its lower Head is divided into two. The Thigh-bone below its middle becometh thicker, and its lower end terminateth into an ample and broad Head; out of the backſide of which are produced two Proceſſes, as it were two other Heads, betwixt which there is a large ſpace left about two inches wide, which receiveth a protuberation or ſwelling of the Head of the Leg-bone.

Theſe two Heads at the lower end of the Thigh-bone are on their outſides rough, but their inſides are covered with a Griſtle, and thereby are made ſmooth and ſlippery for the more eaſiy motion of the Joint. One of theſe Heads is thicker, and is ſeated inward; the other is thinner but broader, and is ſeated outward. From them do ſome of the Muſcles that move the Leg ariſe; and into them are ſome that move the Thigh inſerted. The ſides of theſe Heads are full of little holes, out of which do iſſue the roots of the Ligaments which ſtrengthen the Stifle-joint.

Their Cavities. Theſe Heads have alſo four *Cavities*, two of which are in the middle between the two Heads, and one on the outſide of either of them. One of the middle Cavities, being the foremoſt, is made to receive the protuberation of the *Patella* or Pan, and is therefore cruſted over with a Griſtle for that purpoſe. The ſecond of the middle Cavities being more backward, is deeper than the other, alſo rough and unequal, made to receive the protuberation of the Leg-bone. The third is at the outſide of the outer head, and the fourth at the outſide of the inner, through both which the Tendons of ſeveral Muſcles of the Leg deſcend.

The Patella. At the lower end of this Thigh-bone, betwixt it and the Head of the Leg-bone, on the fore-ſide, is placed a ſmall roundiſh Bone, (called the *Patella* or Stifle-pan) about three inches broad, being plain without, but within bunching, bored through with many ſmall holes. It is covered over on its inſide with a Griſtle, and is made firm in its place by the broad Tendons of the ſecond, third and fourth Muſcles that extend the Leg, to which the *Patella* is very firmly knit. This Bone ſtrengtheneth the jointing of the Thigh-bone with the Leg-bone, and hindreth their diſlocation forwards.

CHAP.

CHAP. XVI.

Of the Leg-bone and Ranges of Offelets which make that part we call the Hock, anſwering to the Heel of a Man.

THERE is the ſame difference between the hinder Legs of an Horſe and a Man's Legs, as we ſhew'd above to be between the Fore-legs of an Horſe and a Man's Arm. For as in Man there are two Bones which reach from the Elbow to the Wriſt, and but one Bone in that Joint of an Horſe's Fore-leg that anſwers to this (reaching from his Elbow to that Joint we commonly call the Knee;) ſo whereas in a Man's Leg there are two Bones, called *Tibia* and *Fibula*; in the ſame Joint of an Horſe that reaches from the Stifle to the Heel, there is but one, which we ſhall call by the name of *Tibia*, or the Shin or Shank-bone, becauſe the Bone of a Man's Leg that goes by that name, is the more conſiderable of the two. *The Shank-bone is but one.*

The *figure* of this Bone is long, and *round* in an Horſe, but in a Man it is three-ſquare. The upper part of it which joins with the Thigh-bone, is broader and thicker than the lower. *Its figure.*

Its *upper Head* in which are two cavities and a prominence betwixt them, is cruſted over with a Griſtle, and both receives and is received by the two Heads and cavity of the Thigh-bone; which Griſtle is faſtned to it by Ligaments. This Griſtle is ſlippery and ſmooth, and the cavities which it lines are full of an unctuous or oily matter or humour, which ſerves to further the motion of the Joint by rendring it moiſt and ſlippery. *Its upper Head.*

The lower part of this Bone, or its lower Head, is round and likewiſe covered with a Griſtle, with which it is made ſomething broad, but notwithſtanding equals not the largeneſs of the upper Head. *Its lower Head.*

This Bone hath ſeveral *Sinus's* and *Appendices*, as well as the Thigh-bone hath; the former for conveniency of the Tendons of ſome Muſcles to deſcend by, and the latter for the riſe or original of other Muſcles which are to move the Foot. *Its Sinus's and Appendices.*

This Bone as well as the Thigh-bone (and moſt other Bones) is notably hollowed within, having its cavity filled with Marrow. It is alſo perforated in ſeveral places, admitting through its perforations ſeveral Veſſels to the ſaid Marrow. *Its Cavity.*

Next come we to the little Bones of the *Hock*, which Joint anſwereth to the Inſtep and Heel of a Man. Theſe are of the ſame number as thoſe of the Knee in the Fore-legs were, and do alſo lie in two ranges, the one above the other, *viz.* three in the upper, and four in the lower. Theſe Bones, as thoſe in the Knee, are ſo cloſely articulated one with another, and ſo cloſely wrapt up and bound together with membranous Ligaments, that it is not eaſie for the Diſſector to diſcover where all of them are divided: ſo that without diligent inſpection they may be taken to be not above half the number they are truly of. *The ſeven little Bones of the Hock.*

To treat of every particular Bone of them and of their connexion one with another, or laſtly of their jointing with the Shank-bone above, or with the three Bones of the *Metatarſus* below, would be in a manner the repeating

repeating of the ſame deſcription over again that we gave above of the ſeven little Bones of the Knee. Onely that which is the hindmoſt and largeſt of them deſerves to have particular notice taken of it, and that is it which is truly, and ought to be called the Heel-bone, whoſe ſhape and poſture you may ſee in the following Figure. Into this Bone it is that ſeveral of the Tendons of the Muſcles that bend the Leg are inſerted. On its inſide it has a large *Sinus* by which the Tendons of thoſe Muſcles that move the lower Parts of the Foot do deſcend, as alſo the larger Veſſels thereof.

The Inſtep-bones. The next Bones to theſe are the three that anſwer to thoſe five that make that part of the Foot in Humane Bodies which is called the *Metatarſus* or Inſtep. Theſe I ſay are but three in a Horſe, though in a Man they are five, to anſwer to the number of the five Toes. They reach from the lower range of the little Bones of the Hock before-mentioned, down to the great Paſtern. One of them is a large, long and round Bone; the other two are much more ſlender, and ſhorter, being the one of them placed on the inſide and the other on the outſide of it, adhering ſo cloſely thereunto, that they are not eaſily to be ſeparated from it. Theſe little Bones anſwer in all things to the like Bones which run down by the ſides of the Shank-bone of the Fore-legs, which from their ſhape I called the Bodkin-like Bones, (as likewiſe the Splent-bones, becauſe they ſtand by the ſides of the middle great Bone, like the Splents that Bone-ſetters make uſe of for ſtrengthning broken Bones till they are knit again;) I ſay theſe are like thoſe, and therefore may be called by the ſame names.

The Paſtern-bones and Coffin-bone. The remaining part of the Bones of the hinder Leg and Foot are the great Paſtern (with the two little triangular Bones adhering to the top of it,) the little Paſtern, and the Coffin-bone; of all which having already treated where I deſcribed the Bones of the Fore-legs, (with which theſe of the Hinder-legs agree in every particular) I ſhall for brevitie's ſake omit ſpeaking particularly of them, and here conclude my diſcourſe of the Bones.

Table XLIV.

Repreſents the Skeleton of an Horſe, (drawn exactly by one that I keep ſtanding in a Preſs.)

AA *The Shoulder-blade.*
B *The Breaſt-bone.*
CC *The Shoulder-bone.*
DDDD *The Leg-bones both before and behind.*
EEEE *The little Bones that make the Knee and the Hock.*
FF *The Shank-bones.*
ff *The Inſtep-bones.*
GGGG *The Bodkin-like or Splent-bones.*
HHHH *The great Paſterns.*
IIII *The little Paſterns.*
KKKK *The Coffin-bones.*
LLLL *The little triangular Bones that cleave to the upper end of the great Paſtern.*
MM *The* Os ilium *or Haunch-bone.*

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N *The* Os coxendicis *or Hip-bone.*
OO *The* Os pubis *or Share-bone.*
PP *The Thigh-bones.*
QQ *The little Bone of the Stifle, called* Patella.
RRRRRR *The Cartilages at the end of the Ribs.*
SSSSSS *The ſeventeen Ribs.*
TTTTTT *The upper end of the Ribs where they are articulated into the* Vertebræ *of the Cheſt.*
V *The* Os hyoides, in ſitu.
W *The lower Jaw.*
X *The upper Jaw.*
Y *The* Os occipitis *or Noll-bone.*
1.2.3.4.5.6.7.8.9.10.11.12.13.14.15.16.17. *Are the ſeventeen* Vertebræ *of the Cheſt.*
1.2.3.4.5.6.7. *The ſeven* Vertebræ *of the Loins.*
1.2.3.4.5.6. *The ſix upper Productions or Proceſſes of the holy Bone.*
From the Cypher 1. *to* 18. *are repreſented the eighteen Bones of the Rump or Dock.*
I.II.III.IV.V.VI.VII. *Shew the ſeven* Vertebræ *or Rack-bones of the Neck.*

CHAP. XVII.

Of the Hoofs of an Horſe anſwering to the Nails of a Man's Fingers or Toes.

COncerning the Nails of a Man's Fingers and Toes (to which the Hoofs of Horſes bear a reſemblance) learned Men are divided into ſeveral opinions about their generation. *Hippocrates* is affirmed to be of opinion, that they are made of a glutinous matter or moiſture parched and dried by heat, and driven to the extreme parts. *Empedocles* thinks them to be made of the extremities of the Nerves, calling them *Nervorum clauſulas ſummas*, the utmoſt terminations or boundaries of the Nerves; and that therefore when theſe fall off, it is a ſign of great weakneſs. *Ariſtotle* in lib. 2. cap. 6. *de generatione Animal.* ſaith, that the Nails, Hairs, Beaks of Birds, Hoofs of Beaſts, and ſuch like, are ingendred of *adventitious* aliment. And laſtly, *Columbus* thinks they take their original partly from the Skin, and partly from the Tendons of the Muſcles which move the Fingers and Toes, and that they are encreaſed like the Teeth by an appoſition of aliment to their root.

How the Hoofs are nouriſhed, and how faſtened upon the Foot.

As for the *Hoofs* of Horſes, whatever be their original matter, out of which they are formed, their growth ſeems to be (according to the opinion of the laſt mentioned Authour) from the addition of new particles to their roots, which drive down ſucceſſively thoſe before them. They are of a middle ſubſtance betwixt Bones and Griſtles: not ſo hard as Bones, for then they would be apt to ſplinter and break; nor ſo ſoft as Griſtles, for if they were, they could not ſupport ſo great a bulk as

the Body of an Horſe, much leſs endure to travel amongſt ſtones, &c. But they are of a horney ſubſtance, without ſenſe, growing pretty firmly to the parts included within them, and faſtened to the Coffin-bone by a Ligament that proceeds from their top or root, which root the Skin alſo ſomewhat encompaſſeth.

Under them lie many twigs of Nerves, and Tendons of Muſcles, which run even to the very bottom of the Hoof or Soal of the Foot, upon pricking of which with a Nail or the like, or when they are but bruiſed with riding in hard way, the Horſe preſently bemoans himſelf, as was more at large ſhewed before in the twelfth Chapter of this Book.

CHAP. XVIII.

Of a Cartilage or Griſtle.

AS an Appendix to the hiſtory or doctrine of the Bones, it will not be unneceſſary to ſpeak ſomewhat of the *Cartilages* or *Griſtles*: eſpecially ſeeing through the whole diſcourſe of this Fifth Book we have had occaſion ever and anon to mention them, but have not as yet given any particular account of them; as neither of a *Ligament*, which we have alſo often mentioned: but of this latter in the next Chapter, and onely of the *Griſtles* in this, becauſe they come neareſt to the nature of Bones.

A Griſtle what. A *Cartilage* is a *ſimilar part, cold and dry, made* (as ſome Authours affirm) *out of the moſt glutinous part of the Seed.* They are flexible and without ſenſe, and are much ſofter than a Bone, though the nature of the one is not ſo much diſtant from the other, but that ſeveral Griſtles in tract of time, and as the Creatures grow old, harden into Bones.

Their uſes. The *uſes* of the *Griſtles* are many. For *firſt* they help the motion of the Bones at their jointings one with another. For which end in the Joints that are ſubject to great motions, the edges of the *Sinus*, or Cups and Cavities of the Bones that articulate one with another, are generally lined with a Griſtle, to make the motion more glib and ſecure; ſuch are the articulation of the Shoulder-bone with the Shoulder-blade, of the Thigh-bone with the Hip-bone, and ſeveral others.

A *ſecond* uſe of the Griſtles is by *yielding*, a little to give way to the violence of outward injuries; whereas if Bones had been in their places, they would have been in danger of breaking, from their hardneſs and ſtiffneſs: for which end the ends of many Bones which are expoſed to external injuries are furniſhed with Griſtles, as the Noſe and Ears, and the like.

Another uſe of the Griſtles is, that by their mediation, as it were by a glue, ſome Bones might be conjoined; as the Share-bones in particular are by this means united to one another.

There are many other *peculiar* uſes of particular Griſtles, ſome belonging to the Sight, ſome to the Hearing, ſome to Smelling, ſome to Reſpiration or breathing, and the like; all which have their ſeveral denominations:

nations: But of theſe we have already treated as they fell in our way, when we diſcourſed of the parts to which each did belong. I ſhall not therefore need to inlarge any further upon them in this place.

CHAP. XIX.

Of a Ligament.

AS the lubricity or ſlipperineſs of Griſtles makes the motion of the Bones more eaſie and glib; ſo the *Ligaments* do ſecure that motion by ſtrengthning the articulation of one Bone with another.

A *Ligament* is a *ſimilar part, cold and dry, of a middle nature betwixt a Griſtle and a Membrane*; harder than Membranes, leſt in vehement motions they ſhould be broken; and ſofter than Griſtles, that they might the more eaſily follow and obey the Muſcles which move the Bones. Thoſe that tie one Bone to another are generally inſenſible, as well becauſe they receive no Nerves into them, as alſo leſt being perpetually moved they ſhould breed perpetual pain. But ſuch as tie other parts, as the Ligaments of the Liver, of the Womb, the bridle of the Tongue, *&c.* theſe are endued with ſenſe. *A Ligament what.*

The *differences* of Ligaments are many, being taken firſt from their *ſubſtance*, whence ſome are ſaid to be hard, others ſoft, the former of which are called cartilaginous, and the latter membranous Ligaments. The epithet of *membranous* is likewiſe given to ſome from their breadth, in oppoſition whereto others are called *nervous*, becauſe they are round like Nerves. *Their differences.*

They are alſo diſtinguiſhed from their *original* and *inſertion*; for ſome *ariſe* from Bones, ſome from Griſtles, and ſome from Membranes; and are accordingly diverſly *inſerted*. And laſtly they are differenced from their *ſtrength* and *figure*. To give particular inſtances of all which, would be a needleſs curioſity: I ſhall therefore break off when I have added a word of their *uſe*.

The *uſes* of the Ligaments, as well as Griſtles, are many: for *firſt* they confirm and ſtrengthen the articulations of the Bones: they *alſo* bind and faſten the Bones to one another where there is no true articulation. *Thirdly*, they ſerve as an outward garment to the Tendons of the Muſcles, many of which are throughout their whole length covered with Ligaments and Membranes. *Fourthly*, they interpoſe like a Pillow betwixt the Bones and the Tendons of the Muſcles. *Fifthly* and laſtly, ſome of them do ſerve to ſuſpend the Bowels, that they ſhould not fall with their great weight, ſuch are the Ligaments of the Liver, *&c.* *Their uſes.*

The End of the Fifth Book.

THE
APPENDIX,
Containing Two
DISCOURSES:
The one, of the
GENERATION
OF
ANIMALS;
And the other, of the
MOTION of the CHYLE,
And the
CIRCULATION of the BLOUD.

By the ſame Authour.

A A A

By the same Author:

CIRCULATION of the BLOOD.

And the

MOTION of the CHYLE.

And the origin of the

ANIMALS:

OF

GENERATION

The one of the

DISCOURSES:

Containing Two

APPENDIX,

TO THE

SECTION I.

Of the Generation of ANIMALS.

The PREFACE.

IN the Introduction to the foregoing *Anatomical Treatiſe I premiſed, that my inducement to compile and publiſh it was to inſtruct thoſe of my own Profeſſion in the* frame *and* uſe *of the Parts of that Creature which is the Subject of our Art. And becauſe moſt Farriers are Perſons of ſmall literature, I promiſed and intended to write the Diſcourſe in ſuch plain and familiar phraſe as they might be capable of apprehending, that they might reap that benefit from it which was deſigned them. (And I have as much as I could endeavoured to ſerve that firſt intention.) But upon publiſhing my Propoſals for printing this Book, finding that it would not be unacceptable to Perſons of the beſt rank, as well of the Nobility as Gentry, I thought it adviſeable not to pen it in too paltry and homely a ſtyle, leſt it might be nauſeous and unpleaſant to ſuch worthy Perſons as by their Subſcriptions were pleaſed to give me encouragement to go on with the Work. So that I hope in the peruſal of it, it will both be delightfull to theſe latter ſort of Readers, and yet inſtruct and benefit the former, for whom onely (as I ſaid) it was at firſt intended.*

But now as to the following *Diſcourſe which was alſo mentioned in the Propoſals, I found that not onely the Men of my own Profeſſion made ſmall reckoning of it; but I was cenſured by ſome of note, for pretending to treat of things above my capacity. I muſt confeſs I was a little abaſhed and diſcountenanc'd at this Cenſure, as having but a ſmall ſhare of that confidence whereby ſo many recommend themſelves to the World: inſomuch as growing jealous of my own ability, I took advice upon it. And it was my good fortune to meet with a Perſon, that upon my imparting my thoughts to him, encouraged me to go forward, promiſing, if I needed any, to lend me ſome aſſiſtance. And I muſt acknowledge that the Reader (and my*

ſelf) are very much *owing to his kindneſs for the beginning of this Treatiſe; and* partly *alſo for the* compoſure *of the Remainder; (though the Obſervations, which are the ground of the Diſcourſe, be wholly mine own:) for I durſt not truſt my Pen alone in what I perceived would be ſcan'd with ſome ſeverity. He that doth not underſtand it, may believe it was not writ for* his *uſe; and he that doth, is deſired to accept it in good part.*

And now to give ſome more particular account of it:

It will not be expected that an Appendix *or Supplement ſhould contain an Hiſtory of the Generation of* all *Animals; for that would require ſeveral Volumes: but it will ſuffice to deſcribe the Generation of one* Oviparous *and another* Viviparous *Creature (the Young of one being formed* without, *and the other* within *the Body) to which all others whatſoever may be reduced.*

By Animal *I underſtand every thing that hath ſenſe and motion. Concerning which it will not fall in my way to diſcourſe of their ſeveral* natures *or* actions, *thoſe conſiderations lying before him that would treat of Animals already perfectly generated and matured: but my province will be to ſhew* (1) *from what* original matter, *and* (2) *by what* efficient cauſe *Animals are generated, and* (3) *in what* order *and by what* degrees *their* Parts *are firſt delineated, and at laſt come to be perfected.*

1. The original matter of Animals.

Firſt then as to their original matter, *I affirm univerſally of all Animals, that it is an* Egg, *either formally, or ſomething analogous thereto, and which upon many accounts may not improperly have that appellation given it: Yea this term may be applied not onely to Animals, but to the Seeds of Plants or Herbs, and Kernels of the Fruit of Trees alſo. And indeed ſeeing the Young of every Animal in their ſeveral ſpecies arrives to a conſiderable bulk before it hath any Animal life, during which time it encreaſes and grows merely as a Vegetable; there is no ſuch great difference in the firſt principles and manner of growth of Vegetables and Animals as is commonly conceived. And therefore to ſatisfy the Curious, and to lay the* lower *and* firmer *foundation for my deſign, I ſhall in the firſt place premiſe the manner of procedure in the vegetation of Seeds from the microſcopical obſervations of* Malpighius *in his ſecond Part of the Anatomy of Plants.*

Now

Now that both Vegetables and Animals ſhould proceed from Eggs, will ſeem no very ſtrange notion to him that hath read the Saying of ſome old Philoſophers, Ex Ovo omnia, *that all things are from an Egg: though I muſt confeſs that it is not neceſſarily to be underſtood in my ſenſe, but poſſibly means no more than that the firſt formation of all things was from an Egg, according to the opinion delivered by* Ariſtophanes *in his* Aves, *p.* 573. (*quoted by Doctour* Cudworth *in his* True Intellectual Syſteme of the Univerſe, *p.*121.) *namely that at firſt there was nothing but* Night *and* Chaos, *which laying an Egg, from thence was produced* Love, *and that mingling again with* Chaos *begot Heaven and Earth, and Animals, and all the Gods. Whoſe Greek Verſes to this purpoſe are thus tranſlated by the aforeſaid Learned Doctour.*

Firſt all was *Chaos*, one confuſed heap,
Darkneſs enwrapt the diſagreeing deep;
In a mixt croud the jumbled Elements were,
Nor Earth, nor Air, nor Heaven did appear;
Till on this horrid vaſt Abyſs of things
Teeming *Night*, ſpreading o'er her cole-black wings,
Laid the firſt *Egg*; whence after Time's due courſe
Iſſu'd forth *Love* (the World's prolifick ſource)
Gliſtring with golden Wings, which flutt'ring o'er
Dark *Chaos*, gendred all the numerous ſtore
Of Animals and Gods, *&c.*

I know that the term Egg *is not alike properly applicable to the firſt ſeed or principle out of which* every *thing is formed; but for diſtinction ſake it may ſeem more proper and intelligible to call ſuch principle by ſeveral names; as in Humane kind and Quadrupeds to call it a* conception; *in Fiſhes to name them* Roes (*though in Latin they have no other name but* Ova, *Eggs;*) *in Frogs, the* Spawn; *in Inſects, as Butterflies,* &c. Worms (*according to* Ariſtotle;) *as likewiſe in Plants to term them* Seeds; *in the fruits of Trees,* Kernels. *I ſay it may ſeem more proper to retain this vulgar way of ſpeaking, and rather uſe theſe ſundry appellations, than to confound them all under one general one: I will not therefore contend about* words, *but ſhall readily permit every man to uſe his own phraſe; onely I contend for the* thing, *hoping to make it*

appear

appear that there is ſo great an analogy or likeneſs in Nature amongſt all theſe, that nothing (but the common way of ſpeaking) hinders, why they might not all be included under one denomination.

If any think I begin too far off my ſcope, to treat of the vegetation of Plants, *when my deſign is to explain the generation of* Animals; *beſides what Apology the thing it ſelf will make for me with every Intelligent Reader,* Moſes's *Hiſtory of the Creation ſeems to authoriſe ſuch a method, and to chalk out my way for me. We find the Almighty proceeding every day from the more imperfect and ignoble Creatures to the more perfect and noble: Whence on the third day he commands* the Earth to bring forth Graſs, the Herb yielding Seed, and the Fruit-tree yielding Fruit after his kind, whoſe Seed is in it ſelf, upon the Earth. *On the fifth day he commands* the Waters to bring forth abundantly the moving Creature that hath life, and Fowl that may flie above the Earth in the open Firmament of Heaven. *And laſtly on the ſixth day he bids* the Earth bring forth the Living Creature after his kind, Cattel and creeping thing, and Beaſt of the Earth after his kind: *and on the ſame day* he created Man in his own image to have dominion over the Fiſh of the Sea, and over the Fowl of the Air, and over the Cattel, *&c. Whether God obſerved ſuch a ſucceſſive* order of time *in the Creation, as the holy Text deſcribes, or whether the Hiſtory be onely ſo delivered for our better apprehenſion, is too deep and bold a ſpeculation for me to meddle with: but it is plain that it* literally *accords with the* nature *of the things created*; *ſeeing the progreſs is natural from Vegetation to Animality, and from thence to Rationality. For thus a Man is for ſome months onely a ſort of Vegetable, capable of increaſe of Parts, but without ſenſe or motion, which afterwards he comes to be indowed with, but without any* exerciſe *of Reaſon till ſome time after his birth. But this laſt conſideration is beyond my purpoſe, and onely mentioned to ſhew, that the ſame method* Moſes *obſerves in the Hiſtory of the* Creation, *is natural enough to follow in an Hiſtory of* Generation.

2. The efficient Cauſe of Generation.

As to the efficient Cauſe *of Generation, that is the* geniture *of the Male. I ſpeak of* proper *generation, and of ſuch Animals whoſe ſpecies conſiſts of Males and Females. For there is a generation called* equivocal, *ſuch as that is ſaid to be of*

Frogs

Frogs generated out of the Mud of the River Nile *by the heat of the Sun: and there are ſome Animals whoſe whole Species are Hermaphrodites as it were, partaking of both Sexes, and generating within and of themſelves, even as Plants do. Of theſe I muſt not be underſtood, but of ſuch whoſe generation is performed by a copulation of Male and Female.*

Laſty, as to the method *and* order *of the formation and increaſe of the Parts of the Animal, till it come to be a perfect one of its kind, it would be prepoſterous to enter upon the treating of* them *in this place; I ſhall therefore refer the Reader to the following Diſcourſe, to which I now addreſs my ſelf.*

3. The order of the formation of the Parts.

CHAP.

Frogs generated out of the Mud of the River Nile by the heat of the Sun: and there are some Animals whole Species are Hermaphrodites as it were, partaking of both Sexes, and generating within themselves, such as Plants do. Of these I must not be understood, but of such whole Generation is performed by a copulation of Male and Female.

Lastly, as to the method and order of the Formation and increase of the Parts of the Animal, 'tis it come to be a perfect one of its kind, it would be tyrannous to enter upon the treating of them in this place; I shall therefore refer the Reader to the following Discourse, to which I now address my self.

The order of the formation of the Animal.

CHAP.

CHAP. I.

Of the Vegetation of Seeds, particularly of a Wheat-corn.

THE conception of an Animal and the firſt formation and encreaſe of an Embryo in the Womb, correſponds very much (as we have already hinted) to the Seed of a Plant and its vegetation in the Boſom of the great and common Mother, the Earth. Wherefore the obſerving in what manner a Seed proceeds to a Plant being obvious to every Man; to give an account of ſuch obſervation may much conduce to the better apprehending by what degrees a Conception grows to a perfect *Fœtus*. But the parts of a Seed being ſo minute, that the naked Eye can make no perfect diſcovery of the firſt rudiments of the Plant that is formed out of it, it is neceſſary to make uſe of a Microſcope to greaten the Objects, which the moſt curious *Malpighius* hath done with that accuracy as to render further inquiry and examination needleſs. I ſhall therefore give you an account of his obſervations of this kind in as few words and as plain as I can.

The manner of vegetation in Seeds.

The Eggs (or Seeds) of Plants being excluded out of the Mother's Egg-bed (called a Pod, or Husk, or by whatever other name diſtinguiſhed) requiring further foſtering and brooding, are committed to the Earth by the officious Winds, or by the induſtry of Men. This kind Mother having received them into her Boſom, doth not onely give them incubation or brooding by her own halituous vapours joined with the heat of the Sun-beams; but doth by degrees abundantly ſupply what the fruitfull Seeds ſtand in need of. For ſhe every-where abounds with little chanels or ſinuous paſſages, in which the Rain-water ſatiated and impregnated with fruitfull Salts does run like the Bloud and Chyle in the Arteries of Animals; which moiſture is tranſcolated or ſtrained through the Pores or Pipes of the outer rind or husk (correſponding to the Membranes that inveſt the Embryo's of Animals) on the inſide of which lie the thick ſeminal Leaves, which are commonly two, (though in that which we ſhall inſtance in by and by, it is but one) that anſwer to the *Placenta* or Womb-cake in Women, or to the Cotyledons in Brutes. For the ſubſtance of theſe two Seed-leaves conſiſts of a great number of little bladders or bottles, and of Navel-veſſels, or a Navel-knot. Into the bottles is received the fruitfull moiſture of the Earth that is ſtrained through the rind of the Seed, which makes a ſmall fermentation with that proper juice that was inherent originally in the Seed-leaves; and this fermented Liquor is conveyed by the umbilical Veſſel to the Trunk of the Plant, and to the Gemm or Bud that is continued to it; whereupon a vegetation and increaſe of the Parts ſucceed.

This, in ſhort, is the manner of procedure in the vegetation of Plants; how far it agrees with the firſt formation and encreaſe of the Embryo's of

Animals, will be made more plain by and by. In the mean time, that what I have here abſtracted out of the above-mentioned moſt ingenious Authour, may be the better underſtood, I have thought good further to tranſcribe out of him an inſtance or example of this procedure, and to exhibit the ſame alſo in a curious Figure to the Eye of the Reader that cannot ſo well conceive of it by the bare verbal deſcription. My inſtance ſhall be in a grain of *Wheat*.

An Hiſtory of the vegetation of a Wheat-corn.

"The *firſt* day after it is ſown, it grows a little turgid, and the ſe-
"cundine or husk gapes a little in ſeveral places. The body of the Plant
"A being continuous with the conglobated Leaf, (which is called the
"fleſh of the Seed that makes the flowr) ſwells not onely with the Gemm
"or Sprout, that is, with the future Stem B, which is opened and wax-
"eth green by degrees; but alſo the lateral Roots CC do bunch out a
"little; and likewiſe the lower Root D becoming green jets ſomewhat
"out; whence the *Placenta* or Seed-leaf E becomes looſe and gapes.
"The body of the Plant is continued and knit, by the Navel-knot F, to
"the conglobated Flowr-leaf, which ſupplies matter for vegetation.

"In *two* daies the Secundine or Husk G being broken through, the
"Stem, or top of the future Straw H appears on the outſide of it, and
"with its top is a little diſtant from the Leaf (that is continued to it)
"growing upward by degrees. The Seed-leaf I guarding the Roots, be-
"comes turgid with the little bladders, and puts forth a white down;
"this Leaf being pulled away, you may ſee the Roots of the Plant made
"bare, of which the long one K is very apparent, but the two others LL
"are more obſcure. The top of the Stem H is crooked; and within,
"the Gemm or Bud and future Leaves and Stalk lie hid. Between the
"Roots and aſcending Stem, the trunk of the Plant is knit by the Navel-
"knot M to the Flowr-leaf which is very moiſt, but as yet keeps its
"white colour, and its proper and natural taſte.

"The *third* day *approaching*, the pulp of the conglobated or round Leaf
"becomes turgid with the juice that it has received from the Earth fer-
"menting with its own genuine juice. The Plant encreaſes in bigneſs;
"and its Bud, or Stem N becoming taller, from whitiſh turns ſomewhat
"green; and the lateral Roots OO break forth greeniſh and pyramidal
"from the gaping Sheath P, which adheres cloſely to the Plant. The
"lower Root Q becomes longer and hairy, having many Fibres growing
"out of it. At the ſame time, in ſuch Seeds as are more quick and for-
"ward, the lower Root R is larger, growing green in its end, and the
"Side-roots ſprout out of the Sheath S that inveſted them: which Sheath
"ſwelling with white and thick bladders, is continued, like a bark, with
"the outer and inveſting ſubſtance. Abundance of hairy Fibres hang all
"along upon the Roots, except upon their tip: thoſe which grow about
"their baſis are longer, and thoſe which follow, become ſhorter and
"ſhorter. They twirle about the ſaline Particles, and little lumps of
"Earth, like Ivy, whence they grow curled. The *Placenta* T fades by
"degrees, and above the lateral Roots SS there break out two other lit-
"tle ones UU. The Stem X being roundiſh and waxed bigger grows
"ſtreight upwards.

"Towards the *end* of the *third* day, the Stem Y tending upwards,
"makes as it were a right angle with the ſeminal Leaf Z lying horizon-
"tally: it is ſlenderer and more longiſh; and its outer cover is white,
"and bright or tranſparent, guarding the tender and greeniſh Gem. The

"laſt

" laſt Roots *a* jet out more; and the other three growing larger are cloa-
" thed with a down, that ſtraitly embraces the lumps of Earth: this down
" is ſo luxuriant, eſpecially where it meets with any vacuity, that its hairs
" uniting with one another make a kind of net. The conglobated or
" Flowr-leaf Z is ſofter, and milky as it were; whence if one bruiſe it, it
" yields a white and ſweetiſh juice like Barly-cream: if one pull the
" Plant from it, the Roots and Stem of the Plant are plain to be ſeen:
" alſo the intermediate Navel-knot *b* appears, whoſe outer and inveſting
" part is more ſolid like bark; but the inner part is more ſoft and mar-
" rowy.

" At the end of the *fourth* day, the Stalk tending upwards, (the outer
" or Sheath-leaf *c* being looſened) puts forth the *Stable*-leaf *d* that is green
" and folded. Below, the afore-deſcribed Roots grow longer; and there
" appears a new tumour (ſometimes two,) of a future Root *e*. The Seed-
" leaf *f* alſo that hangs upon the Plant begins to fade, whoſe remaining
" juice notwithſtanding is as yet white and uncorrupted. If one cut the
" Stem inſunder, the riſe of the tender Stalk *g* appears to be from the Na-
" vel-knot, from which alſo the Roots take their beginning: outward-
" ly likewiſe the Sheath-leaf *c* is to be ſeen, wherein the Stalk, and its
" Leaves, and the riſe of the Roots are infolded.

" About the *ſixth* day, the *Stable*-leaf *h* being looſened, the Plant
" mounts upward, the thick Sheath-leaf *i* as yet cleaving about it like a
" bark. The Seed-leaf *k* on its outſide is ſinuous or full of crinkles, and
" faded: this being cut and freed from the huſk or ſecundine, the Fleſh
" or *Pericarpium* is not alike all over; for its outer part, whereby the
" outſide of the Seed or Grain is heaved up, is more ſolid, and looks like
" a concave Leaf: it hath the ſame appearance alſo in that part whereby
" it ſticks and is continued to the Navel-knot: but its inſide is fiſtulous
" and fill'd with humour, eſpecially that part of it that is next to the Na-
" vel-knot. The Leaves being pull'd off, the Roots torn, and the Flowr-
" leaf removed, the trunk appears, in which, not far from the Roots,
" the Navel-knot *l* bunches out, which is ſolid, and hard to cut: above,
" there is the mark of the Sheath-leaf *i* that was pull'd off: under this,
" as in an Arm-pit, the Gemm *m* is often hid; beyond which there is like-
" wiſe a knot, with the ſkar of the torn off Leaf *n*, and in the top the
" ſoft Gem *o* is kept; and thus the whole bulk of the future Stalk is had
" in this *compendium*. The hinder-part alſo of the Plant ſhews the
" breakings forth of the Roots; likewiſe the faded *Placenta* or Seed-
" leaf *p*, and the ſkar of the Sheath-leaf *i*, with the following Knots and
" Gemm *o*.

" After the *eleventh* day, the Seed-leaf *q* often as yet ſticking to the
" Plant, is crumpled and almoſt corrupted; for being opened, it yields
" an humour with airy bubbles: within, it is hollow, and about the ſe-
" cundines the mucous and white ſubſtance of the Seed, being continued
" even to the Navel-knot, formes a cavity. All the Roots becoming lon-
" ger put forth new Branches out of their ſides; and the Stalk, though it
" have taller Leaves, yet for the moſt part it is no longer than the trunk
" above delineated: for as yet the knots and gems being very near to one
" another, are not far from the Navel-knot. Sometimes, the vegetation
" making progreſs, the ſpaces betwixt the knots are larger; and the
" Sheath-leaf *r* being pull'd off the ſide, a Knot *ſ* appears, out of which
" there ſprouts forth a Leaf *t* that foſters the aſcending Stem. In the mean

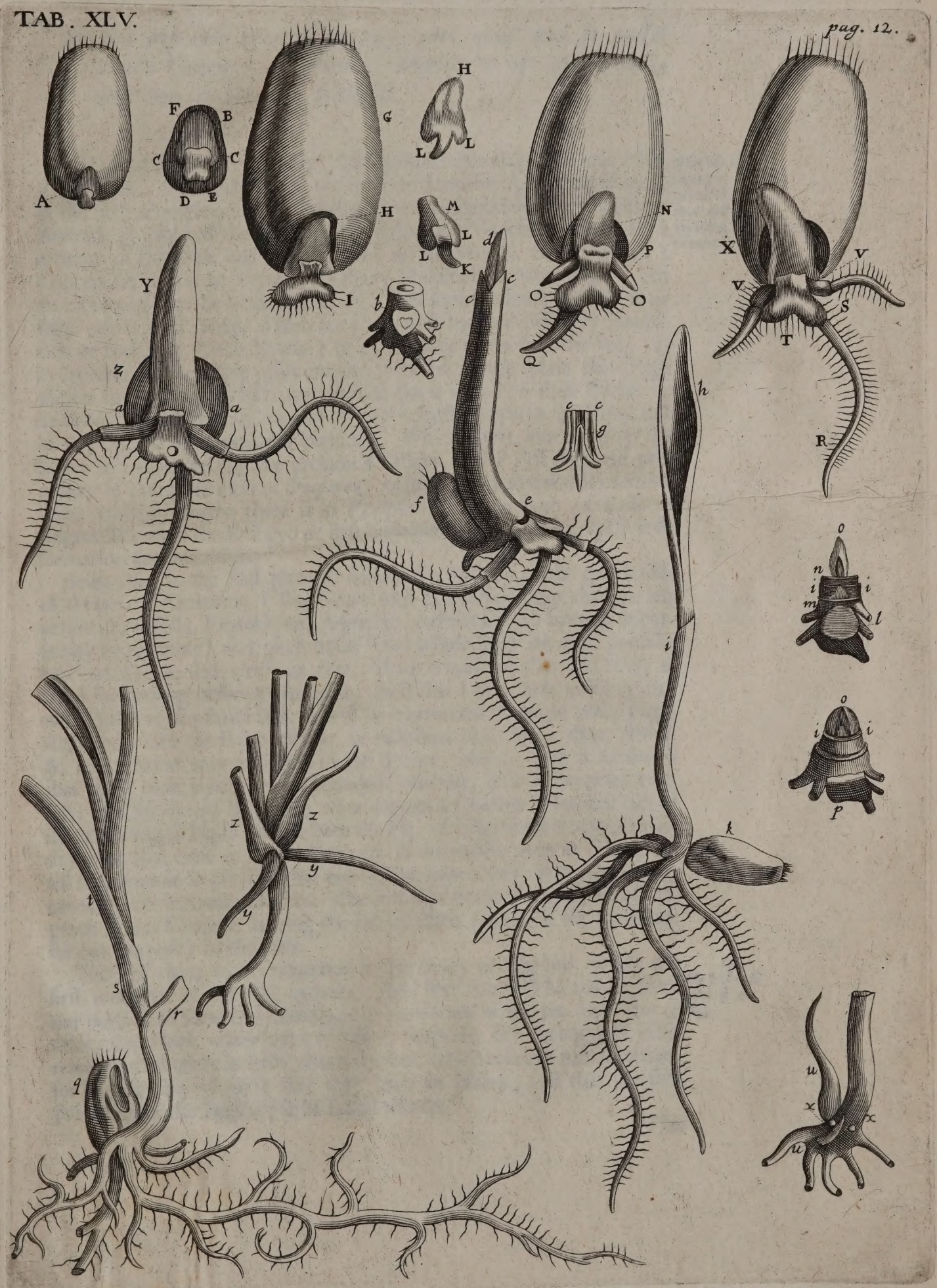
" time the ſeminal Leaf withers, and is emptied on its inſide; and if one " preſs it, it yields nought but Water. The white and ſolid internode " (or ſpace between the Knots) is lengthned, and new Gemms appear; " and the middle Root grows to be ſeveral inches long.

" After a *month*, both the Roots and Stalk being grown longer, new " Buds *uu* appear to be breaking forth of the firſt Knot, and very little " Tumours *xx* bunch out, which at length break forth into Roots: for " Roots ſprout out ſo eaſily, that ſometimes if one pull off the firſt " Roots, there will abundance of new ones ariſe in their ſtead. Like- " wiſe at the ſame time, the Stem being eſtabliſhed with its uſual Roots, " puts forth new ones *yy* which break through even the Sheath-leaf that " cloaths it: and it alſo riſes up with a white joint that is full with- " in. Above the Roots from the ſame Knot grow two Buds *zz*, guard- " ed with their proper Leaves; and the intermediate Stalk runs up- " wards.

This Hiſtory it was thought good to tranſlate at its full length, (though there are ſome particulars that may ſeem beyond our purpoſe, and which are not mentioned in the general deſcription of Vegetation that was premiſed) leſt we ſhould be injurious to the moſt ingenious Authour by concealing any of his diſcoveries. But paſſing by *them*, it will appear plainly by the following diſcourſe, how little the formation of an Embryo and firſt encreaſe of its Parts, differs from the firſt ſpringing of a Vegetable; and then the Reader will further ſee how natural and reaſonable it was to begin with the deſcription of this latter, the better to explain the former.

CHAP.

TAB. XLV.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CHAP. II.

Of the first rudiment of an Egg, and what way it passes to the Uterus; *also how it attains to its great bulk, and how it becomes fruitfull.*

What the difference is between Oviparous *and* Viviparous *Creatures.*

ANIMALS are commonly, distinguished into *Oviparous* and *Viviparous*; by which we are not to understand any specifical difference in the first principle or original matter of one and another, as if Oviparous Animals propagated their Species by Eggs, and Viviparous theirs by a mixture of the Male and Female's Seed in the Womb, out of which a Conception should be formed; as many Philosophers have taught: but no more ought to be meant by it, than that some Animals exclude their Eggs out of their Body, which are afterwards hatched either by incubation or brooding, (as in Fowls;) or by the bare warmth of the Sun, (as in Insects;) or by some other means; whereas others retain their Eggs within their Bodies, which are hatched (as it were) in their *Uterus* or its *Cornua*, and when an Animal of their respective Species is formed out of any one, it is afterwards excluded. Which truth, that it may the better be entertained by the prejudic'd Vulgar, I will first shew the procedure in the generation of *Oviparous* Animals, and afterwards examine what analogy thereto there is in *Viviparous*, and in both of these to Vegetables, as to the Embryo or first lineaments of the *Fœtus*, both as to formation and nutrition.

Being then in the first place to deliver the History of the generation of *Oviparous* Creatures, I shall wave such as exclude Eggs that are less perfect, as Insects, Reptiles, and Aquatiles, (which last we have no opportunity to examine) and pitch upon Fowl whose Eggs are most perfect; and out of them shall chuse an *Hen*, which is most familiar and ready at hand for making observations upon. And that I may omit nothing that will illustrate the similitude, it will be convenient to begin with inquiring, *first*, into the first principle, or rudiment of an Egg; then, *secondly*, see by what way it passeth to the *Uterus*; *thirdly*, how it attains to that great bulk it hath when excluded; *fourthly*, how it becomes fruitfull; and *fifthly* and lastly, by what degrees a Chicken is formed out of it, exhibiting in Figures taken from the life, of what shape it appears each day from that time any of its Parts are so discernible as to be delineated, till it is become so perfect, that one cannot take a view of or examine its inward parts without dissection. The first four heads of inquiry I shall dispatch in this Chapter, leaving the last of them (which is the main one for our purpose) to the next.

The first rudiment of an Egg.

The *first* thing to be examined is the *Ovary* or Egg-bed, where the first rudiment of the Egg appears. And here it would be too far from our purpose to shew the differences of the Ovary of an Hen from that of some other Fowl, much more of Fishes, Serpents, *&c.* seeing those differences consist onely in lesser circumstances, which concern not our scope: for in this they all agree that they have an Ovary, and that the first principles of the Eggs are to be found therein.

This

The Ovary. This Ovary in an Hen is ſeated at the Back-bone upon the great Artery and Vein deſcending, a little lower than the Liver, at the ſame place where the Cock's Stones lie, which is about the place where in Viviparous Animals the preparing Veſſels that go to the Teſticles ariſe. In this the Eggs appear firſt of a white colour, being as ſmall almoſt as Sea-ſand. But after they are grown a little bigger, *viz.* about as big as Hail-ſhot they turn yellow, and are truly onely the Yelks of the Eggs that ſhall be, which afterwards acquire Whites, as we ſhall ſhew by and by. Each of theſe Yelks is inveſted with a proper Coat, and beſides, borrows another from the Ovary, by which they are ſeverally knit to its *foundation*, or *root*, that is, to that part of it that ſticks to the deſcending Trunks of the great Artery and Vein; ſo that hereby they are ſuſtained in their place, even as the Teſticles in Men are clad and ſuſpended by their *vaginal* Coat that is borrowed from the Rim of the Belly (or *Peritonæum.*) Thoſe of the Yelks that are outmoſt are largeſt, thoſe in the middle leſs, but thoſe the neareſt the foundation, leaſt of all.

2. *Which way the Egg paſſes from the Ovary to the* Uterus. *Secondly*, Adjoining unto and embracing the Ovary is the *Infundibulum* or *Tunnel*, which conſiſts of a very thin and yielding Membrane. With it Orifice it encompaſſes the Ovary, and deſcending lengthways of the Back is continued unto the upper and narrower part of the *Uterus*, by Doctour *Harvey* called the *Proceſs* of the Womb. As the Yelks of the Ovary come to maturity, they drop off it one after another, and fall immediately into the mouth of the Tunnel, in which they make no ſtay, but are conveyed by it quickly into the *Proceſs* of the *Uterus*. This *Proceſs* hath many folds or cells, like as the Gut *Colon* has in moſt Creatures, which contribute not onely to the longer ſtay of the Egg in it, but make it more convenient for the collection of that whitiſh clammy humour that ſo plentifully bedews it, out of which the Yelks gather their White. For

3. *How it is encreaſed.* *Thirdly*, Though the Yelks while they remain in the Ovary are nouriſhed and encreaſed by the Arterial bloud as all other Parts of the Body are; yet as ſoon as they are dropt off from thence, they never adhere afterwards or grow to any Part whereby any Bloud-veſſels ſhould be inſerted into them: but as they make no ſtay in the Tunnel, ſo do they not adhere to the ſides either of the *Uterus* (ſpecially ſo called) or of its *Proceſs*. But there being great ſtore of Arteries diſperſed through them both, theſe ſpew as it were out of their ſmall mouths (that open into the Cavity of the *Uterus* and its *Proceſs*) a great quantity of a whitiſh chylous liquor, which the Yelks by an innate vegetative principle attract and aſſimilate to themſelves, and which conſtitutes their White. Now ſeeing (as we noted above) that the Yelks as they come from the Ovary, have two Coats, one proper, and another borrowed; I am of an opinion that the White is collected betwixt theſe two; namely, that the uterine humour tranſudes through or is imbibed by the borrowed Coat, but is ſtopped from proceeding further towards the centre of the Egg by the proper Coat which is more denſe and cloſe. For the *foundation* of the Ovary from whence this outer Coat is borrowed, is of a looſe ſpongy ſubſtance, whence 'tis probable the Coat is ſo likewiſe. Onely 'tis likely that ſome particles of this humour penetrate through the inner Coat alſo, by which the Yelk receives increaſe, and alſo ſome alteration in ſubſtance from what it was of, while it remained in the Ovary. Though I think this opinion is new, yet I am the bolder to profeſs it, not onely becauſe it can-

it cannot well be conceived how a new Coat ſhould be acquired in the *Uterus*, ſeeing the Egg adheres to no part from which it ſhould receive it; but much more from the Analogy there ſeems to be between the nutrition of an Egg (in Hens) and that of a Conception (in Viviparous Animals.) Now every Body knows that a Conception when it is never ſo ſmall, is clad with two Coats, the *Chorion* and *Amnios*, and that the Albugineous liquor of the Womb tranſudes through them both for the nouriſhment of the Embryo contained in the *Amnios*. I ſay it paſſes through *both* the Membranes of a Conception, becauſe it was neceſſary it ſhould arrive at the Embryo which it nouriſheth; but ſeeing the Yelk is ſo far from reſembling the Embryo, that no Part of the Chicken is formed out of it, (for it onely ſerves for a groſſer ſort of nouriſhment for it) the like liquor in an Hen paſſeth onely through the outer Coat which anſwers to the *Chorion*, betwixt which and the inner it is collected for the uſe of the future *Fœtus*. But if we will ſuppoſe with Doctour *Harvey*, that there are two Whites, the inner of a thicker conſiſtence, and the outer of a thinner, and that theſe are included each in a particular Membrane; then *as* theſe Membranes anſwer exactly to the *Chorion* and *Amnios*, ſo muſt we ſuppoſe that the Coat that was borrowed from the Ovary, was *originally* double, and now onely *begins to appear* ſo. (But enough of this.) The Egg then beginning to encreaſe in bulk on this manner at firſt in the *Proceſs* of the *Uterus*, doth by degrees deſcend down into the *Uterus* it ſelf, wherein it grows to its full proportion.

The Uterus *deſcribed.*

Now the *Uterus* is of a carnous ſubſtance, but ſuch as may be eaſily ſtretched lengthways or breadthways, and except when it is diſtended with a perfect Egg, is very full of wrinkles and folds, as we deſcribed its Proceſs (above) to be. When the Egg hath arrived at its juſt bigneſs, ſo that it can no longer be contained in the *Uterus*, it begins to acquire a Shell, which according to Doctour *Harvey* is hard while the Egg is yet in the *Uterus*; though according to *Ariſtotle* and *Aquapendent* the Shell owes its original to that viſcous and clammy humour that bedews the ſurface of the Egg when it is lay'd, the watery part whereof evaporating, the remainder preſently hardens into a Shell. But any Country Houſewife may decide this controverſie as well as theſe great Philoſophers, who by feeling with their Finger whether the Hen be with *ſoft* or *hard* Egg (as they uſe to phraſe it) know whether ſhe will lay that day or no: for if ſhe do, the Egg feels, comparatively, hard, though not quite ſo hard as after it is lay'd.

4. *How an Egg becomes fruitfull.*

Fourthly, If one compare an Egg lay'd by an Hen that hath never been trod by a Cock, one ſhall not find it differ in any one reſpect (ſo far as the Eye can judge) from another that is lay'd by one that has uſed to be trod every day; ſo that it ſeems difficult to give a reaſon why the one ſhould be fruitfull, and the other not. I think it is peculiar to a tame Hen (of which we are ſpeaking) to lay as well without a Cock as with him: in whom therefore the treading is no efficient cauſe of the Egg, but onely of making it fruitfull.

Now it is very conſiderable what Doctour *Harvey* and others have obſerved, that one treading is ſufficient to fertilize a whole knot of Eggs, be they twenty or a greater number; which beſides what we ſhall ſay afterwards, may ſufficiently detect the vulgar opinion of Errour, *viz.* that thoſe ſpecks in the Yelk which we commonly call *the treddle*, are the Seed of the Cock; for how can he be imagined to ſpend ſo much at one time

time as all theſe muſt amount to? But to paſs by that, it is certain that none of the Cock's Sperm can come to the Ovary; for if the Cock have any *Penis* at all (which Doctour *Harvey* denies) yet it is ſo ſhort that it cannot reach one quarter of the way between the outer Orifice and the Ovary: yea that part that is between the *Uterus* and outward Orifice, which anſwers to the *Vagina* in Viviparous Animals, is ſo full of folds and wrinkles that one cannot paſs any thing from without inwards, not ſo much as a Briſtle; ſo that it is not eaſy to conceive how the Cock's *Penis* (if he have any) ſhould penetrate even ſo far as the *Uterus*, which yet is two or three inches diſtant from the Ovary. But notwithſtanding the *impoſſibility* of the Sperm's reaching the Ovary, and the *improbability* that it is injected ſo far as into the *Uterus*; yet it is without all queſtion that the fruitfulneſs of the Eggs is wholly owing to ſome virtue derived from the Seed. Not that any of its groſſer ſubſtance doth conſtitute any part of the Egg; but ſome ſubtil *effluvia* or ſpirituous ſteams exhale from it into the *Uterus*, which aſcend from thence by the Proceſs and Tunnel to the Ovary, fecundating the ſame. I ſay the rudiments of the Eggs are fertilized in the Ovary; for it is not probable that the *Uterus* onely ſhould be impregnated thereby with a fecundating virtue or power, which it imparts to the Egg after its deſcent from the Ovary into it. For though in a tame Hen the Yelks ſeparate and fall off from the Ovary of their own accord, whether ſhe be trod or no: yet in other Fowls it is not ſo, in whom, naturally, the Hen lays no Eggs if ſhe be withheld from the Cock: and it is not to be imagined but that the Eggs of both are made fruitfull in the ſame place. Seeing then it is owing to the geniture of the Cock not onely that the Eggs of wild Fowl become fruitfull, but that they lay any at all; (and therefore the prolifick virtue of the geniture muſt be exerted upon the Ovary from whence the Eggs iſſue:) we may from hence conclude, that though a tame Hen (by a peculiar property) do lay without treading; yet as theſe Eggs are all of them addle, ſo thoſe that are hatchable into Chickens were fecundated before they were parted from the Ovary; for it would be abſurd and unreaſonable to ſuppoſe ſo great a difference in the impregnating the Eggs of the ſame Species of Animals, as the contrary opinion intimates, *viz.* that one ſhould be made fruitfull in the Ovary, and the other in the *Uterus*.

But thus much may ſuffice to have ſpoken of the origine, encreaſe and fruitfulneſs of an Egg; it remains to examine by what means and degrees a Chicken is formed out of it.

CHAP.

CHAP. III.

By what means and degrees a Chicken is formed out of an Egg.

Aristotle in his First Book *of the history of Animals*, says, an *Egg* is that *ex cujus parte fit principio Animal, quod generatur : ex altera alimentum ipsi generato, i.e.* of one part whereof the Animal is generated, and of another, nourished. It is both the seed and principle of the Young, and also the Womb wherein it is formed, fostered and nourished. Out of one Egg is but one Chicken generated : for if at any time there be two, then are there really two Eggs included in one Shell, as we many times see two Kernels in one Nut-shell. *An Egg what.*

Now that we may the better know out of what part of the Egg the Chicken is formed, and by which part nourished, we are to give an account of *all* the *parts* of an Egg. *Its Parts.*

The first and outmost is the *Shell*, which is as the *Womb* wherein the Chicken is hatched. The next is the *White* (or as Doctour *Harvey* will have it, two Whites, the outer being thinner, and the inner thicker) which answers to the nutritious Juice or Chyle in the Womb of Viviparous Animals, and from which the Chicken by its umbilical Vessels receives its first nourishment. And indeed it might as properly be called Chyle, as the Chyle whereby the *Fœtus* in Viviparous Animals is nourished, is called *Albumen* or an *albugineous* Liquor, deriving that name from the White of an Egg, which is so called in Latin : for their names may well be confounded, seeing they are not onely of the same use, but of the same nature also both as to colour and taste, and agree particularly in this, that both of them by the warmth of the Fire will congeal into a gelly.

The next part is the *Yelk*, in Latin called *Vitellum*, from *vita*, because the Chicken *lives* by it. It is otherwise named *Luteum* (the *Yelk* or *Yellow*) from its *colour*. This part also serves for the nutrition of the Chicken, but is of a more terrene and gross nature than the White, and therefore comes to nourish it onely in the second place, when the White is spent, as shall be shewed farther by and by. Both the Yelk and the White are each invested with a Membrane ; yea if there be two Whites, as Doctour *Harvey* affirms, then is the inner and thicker White divided by a proper Membrane from the outer and thinner. Which two Membranes of the White answer exactly to the *Chorion* and *Amnios* in Viviparous Animals, which contain the chylous or albugineous Liquor for the nourishment of the *Fœtus*, as was hinted in the foregoing Chapter. In the Membrane that cloaths the Yelk, towards each end of the Egg is placed a speck or little transparent knot, which are commonly called the *Treddles*, from an opinion that they are the Sperm of the Cock, and that the Chicken is formed out of them. But seeing there are two in each Egg (one towards each end) if these were the Seed or first vegetative principle of the Chicken, then should there be two formed out of every Egg. But Doctour *Harvey* does most ingeniously call them the *Poles* of this

Microcoſm, ſerving for no other purpoſe, than for the uniting of the Yelk to the White; for though they adhere to the Membrane that inveſts the Yelk, yet does the larger diameter or half of them jet out into the White. They are called in Latin *Grandines*, Hail-ſtones, from their colour, as being of a more white and lucid ſubſtance than the White, and reſembling much both in ſhape and colour the ſmaller Hail-ſtones when they have been a little wet.

Having enumerated all theſe parts of an Egg, and not ſuppoſing any of them to be that which is the firſt principle of the Chicken, it may be wondred by ſome, what part is left to which we can aſſign that dignity. The opinion of the often before-cited Doctour *Harvey* is clear and convincing as to this, *viz.* That it is neither of the Knots beforementioned, but another white, round and ſmooth Speck (about as big as a Lentil) that likewiſe adheres to the Coat of the Yelk, about the middle ſpace betwixt the Treddles. And though it is very little, yet that can be no prejudice to the opinion, with him that conſiders, that the Conceptions (or *Ova*) of Viviparous Animals, even of the moſt bulky, are no bigger than a Muſquet-bullet, when they are ſeparated from the Teſticle or Ovary, which ſtate this white Circle or ſpeck is now conceived to be in, and of which I ſhall ſay no more, leſt I ſeem to impoſe upon the learned and ingenious Reader, whom I would rather adviſe to peruſe Doctour *Harvey* himſelf as to this opinion, than ſatisfy his curioſity with this ſhort Abſtract of it. But partly for the ſake of thoſe that want Doctour *Harvey*'s Book *De generat. Animal.* and partly that what follows may be the better underſtood, I thought it convenient to give a touch of it.

5. *By what means and degrees a Chicken is formed out of it.*

Having then concluded upon the firſt *Seed* or principle out of which the Chicken is formed, let us next conſider by what *means* and *degrees* it *vegetates*, and has an Animal generated out of it. We have ſhewn in the foregoing Chapter, that as to the examination by the Eye, there is nothing in a fruitfull Egg which is not in an addle one; yea even this white Circle or Speck laſt mentioned is equally found in both: and the reaſon why it is barren in one and fruitfull in another is its *being* or *not* being impregnated by the Cock's Sperm; ſuch Hens as are not trod laying always addle Eggs, but ſuch as are, for the moſt part prolifick. (But of this enough before.)

The means is Incubation.

Now the *means* of putting this generative (or more properly, I think, *vegetative*) principle into act, is the *incubation* or brooding of the Hen, which influences this *Seed* (or Egg within an Egg) out of which the Chicken is formed, even as the cheriſhing and benign beams of the Sun foſter the Seeds that are committed into the Boſom or Womb of their kind Mother the Earth. Onely here is the difference, that the Seed or Egg of a Plant contains nothing but the vegetative principle, in which as ſoon as the plaſtick power is excited, it attracts nouriſhment from *without* it ſelf, from the Capillary Veins or *meatus* of the Earth, as was ſhewed at large in the firſt Chapter; whereas the Egg is both Seed and Womb, containing all *within* it ſelf, neceſſary both for the formation and nutrition of the *Fœtus*. The reaſon of which is apparent, namely, that a Plant (be it an Oak of two or three hundred years old) is ſtill but an Infant in regard of its nutrition, by its Roots as by ſo many Mouths ſucking the turgid Breaſts of its teeming Mother: whereas a Chick (like all other Animals) as ſoon as its Parts are once formed and animated, is preſently emancipated, as it were, from the Womb of its Mother, neither receiving nor needing any further nutri-

nutriment from thence, but becoming its own Caterer and Carver. Now though the ſitting of the Hen excite the plaſtick power in the aforeſaid white Circle, yet is there no vertue derived to it from the Hen her ſelf, ſeeing an elementary heat which is as gentle, equal and conſtant as that of the Hen, will have the ſame influence upon it. Thus as Hiſtorians relate, the Egyptians uſed to hatch their Eggs by the warmth of a Stove; and thus the Eſtriches Eggs being covered with Sand are hatched by the warmth of the Sun, (which in *Africk* where theſe Fowls are bred, is much more intenſe than in theſe *European* Countreys) the Hen her ſelf neglecting that office, if the opinion of divers Commentators upon the Book of *Job* may be relied upon, where chap. 39. verſ. 14, 15, 16. it is ſaid, that *ſhe leaveth her Eggs in the Earth, and warmeth them in the duſt, and forgetteth that the foot may cruſh them, or that the wild Beaſt may break them. She is hardned againſt her Young ones as though they were not hers,* &c. Concluding then that a gentle warmth, be it Animal or Elemental, is the *means* whereby a Chicken is formed out of an Egg, we ſhall proceed to our every days obſervations, by what *degrees* it is ſo formed.

As for the firſt three days all is ſo imperfect that the ſtate or condition of the Embryo could not with any elegancy or intelligibleneſs be drawn by the Painter, whom I employed to draw the following Figures for the Engraver: but from the fourth day forwards to the thirteenth, and afterwards on the fifteenth and ſeventeenth days, you have in the following Table in what ſtate it appeared every day, which I thought good to exhibit to the Eye, that the diſcourſe may be the better underſtood. *The degrees or order of its formation.*

I therefore for this purpoſe ſet fourteen new laid Eggs (gathered from ſeveral Hens with mine own hands, that I might be ſure none of them had been ſat upon before,) under one Hen, *July* the firſt, 1680. upon which I made theſe following obſervations.

At the end of the *firſt* day (or of twenty four hours) the Yelk had changed its ſituation, being removed from the centre of the Egg up to its blunt end; and it was likewiſe half turned about; for the Treddles that were towards the two ends of the Egg (the one oppoſite to the other) were now turned towards the ſides: and that white Speck or Knot that adheres to its Coat (out of which the Chicken is formed) inſtead of being toward the ſide of the Egg, was now on that ſide of the Yelk that looked towards its ſharper end. This Speck was alſo a little bigger, but without any other ſenſible alteration. At the blunt end of the Egg the hollowneſs; which is natural to all Eggs, was ſomewhat enlarged, and the Yelk was riſen ſo near it, that it might be ſeen through the White, or rather through the Membrane of the White, the White it ſelf being almoſt wholly retired to the ſharp end. The Shell, laſtly, looked a little more dusky than before. *The progreſs of the firſt day.*

At the *end* of *two* days (or 48 hours) the ſaid Speck was enlarged to the breadth of a ſilver Penny, and ſeemed to be of different colours, ſome Parts looking more bright and others more obſcure; and its whole Body jetted out into the White without making any dimple or impreſſion into the Yelk, to whoſe inveſting Membrane notwithſtanding it ſtill adhered. Doctour *Harvey* compares it in this ſtate to an *Eye* (yea calls it by that name) ſuppoſing its Centre to reſemble the *Pupilla* or ſight of the Eye, and its outer Circle (as he calls it) the *Iris*; affirming that the *Pupilla* is the vegetative Seed or principle of the Chicken, and that the *Second day.*

outer Circle conſiſts of the moſt pure and cryſtal-like part of the White (being contained within a proper Membrane) from which the Seed receives its firſt encreaſe, and that therefore as the former dilates its ſelf, this latter is conſumed and obliterated. And this is juſt what happens in Viviparous Animals, in whom the *Ovum* imbibes ſome of the pure albugineous Liquor that bedews the ſides of the Womb; yea it is the ſame that happens to the vegetable Seeds of Plants, which attract the like moiſture through their Husks (or Secundines) from the Earth: for they all three receive their nouriſhment this way, till their Navel-veſſels are formed, and the firſt growth of *all* of them is pure (and alike proper) vegetation.

Third day. At the *end* of the *third* day, I took a third Egg, and breaking it at the narrow end, I found a great alteration in it from the ſtate it was in the day foregoing. For in the centre of the aforeſaid Speck I obſerved a little red Body of the colour of bloud, ſometime plain to be ſeen, and anon diſappearing (by turns.) In the circumference of the Speck a pretty diſtance from the centre there was a reddiſh Circle, betwixt which and the red Body in the centre there run very many ſlender red ſtreaks. The red Body obſerved a conſtant turn of dilating and contracting it ſelf (like to the pulſation of the Heart, which Part it afterward proved) for almoſt a quarter of an hour, in which time the Egg being grown cold, its motion then ceaſed. By this motion it appears there is now a progreſs made from vegetation to ſome degree of Animality. The ſlender red ſtreaks that run from the centre to the circumference, ſeemed all to ariſe from one Trunk, and afterwards proved the Navel-veſſels, which branching out both into the White and Yelk convey nouriſhment from thence to the Chicken.

Fourth day. At the *end* of the *fourth* day all theſe Parts before-mentioned appeared more plain. The little red Body in the centre now ſeemed to conſiſt of two parts, whereof whilſt the one contracted it ſelf, the other was dilated, and on the contrary; which gave me a ſuſpicion, that one of them was the Heart, and the other the Earlets, whoſe contractions and dilatations (or ſyſtole's and diaſtole's) in perfect Animals obſerve that tenour; and ſo I perceived they afterwards proved. The bloudy ſtreaks were now extended further than the reddiſh circle, both towards the White and towards the Yelk: and the Trunk from whence they ſprang, looked not now ſo fair red as it did before, but ſomewhat more dusky, as if ſomething of an aſhy or dull white colour adhered to its outſide, being as it were of a woolly ſubſtance, and ſticking upon the Trunk of the Vein like moſs upon the bough of a Tree. The cavity at the blunt end of the Egg was grown a pretty deal larger than before. The two little red Bodies continued their beating longer than the one had done the day before; and as ſoon as they ceaſed I took them out, and alſo the Aſh-coloured part of the Trunk of the Vein, and put them in fair-water; wherein as the firſt preſently loſt their colour, ſo the latter loſt its ſhape and aſpect it had within the Egg; for I had fancied it to appear like the firſt rudiment (or *ſtamen*) of the Body of the Chicken; but the woolly ſubſtance was not of conſiſtence firm enough to retain its former figure in the water: however I perceived as well by the experiment of the next days Egg, as alſo by another Egg that I ſince broke on the fourth day, that I had fancied right. The form it was in, when taken out of the Shell on this fourth day, you have delineated in the *firſt Figure* of the following Table, which

which ſhews the Aſh-coloured Trunk and woolly ſubſtance, and ſome of thoſe red ſtreaks adhering to it, or proceeding from it.

At the *end* of the *fifth* day the two little red beating Bodies were grown of a fainter colour, for by this time the Parenchyma of the Heart was begun to gather about them. A little diſtance from theſe there appeared the firſt rudiments of the Head, conſiſting of four bubbles, two of which were clear and tranſparent, but the other two of different colours. The two clear ones were the Brain and Cerebel, and thoſe of different colours were the Eyes: Theſe two laſt appeared much bigger than either of the other. One might alſo diſcern the Bill which looked white. In the ſame Egg I obſerved likewiſe the rudiments of the Lungs and Liver, which laſt gathered upon or grew out of the Umbilical Vein. The woolly ſubſtance before-ſpoken of, that gathered about the Trunk of the Vein, was now of a more ſolid and cloſe contexture, and did plainly appear to be the firſt rudiment of the Carkaſe of the Chicken, out of which both Wings and Legs were begun to bud and to be very diſcernable. This Embryo, though all its Parts were imperfect, did yet appear to have life in it, for I could obſerve it to bow it ſelf to and again. Of what form it appeared when it was taken out of the Liquor wherein it ſwam, you have delineated in the *ſecond Figure* of the following Table, being drawn by one that was taken out of an Egg that the Hen had ſat upon five days compleat; which Embryo as alſo all the reſt that we ſhall hereafter in the following diſcourſe ſpeak of, I did preſerve by a Liquor prepared for that purpoſe, and have them all hanging up againſt a Board in the ſame poſture as they are repreſented in the ſaid following Table. *Fifth day.*

At the *end* of *ſix* days all the forementioned Parts were more viſible, yea there is not any Part of the whole Body but a ſcheme of it now appeared. The Heart had acquired its proper ſhape, but looked white, as did alſo the Lungs and Liver; the Eyes ſtood gogling out of the Head, and each of them was as much bigger than the Brain, as the Head (taking in all its Parts) was bigger than all the reſt of the Body. The Brain and Cerebel were as yet onely of a watery ſubſtance, of which the latter ſtood jetting out above the former. One might make ſome faint diſcovery of the Spine or Back-bone, looking whiter than the reſt of the Parts about it, as alſo of the Ribs that were extended forward from it like the fineſt and whiteſt threads of Lawn. There were alſo the Lineaments of the Inteſtins, which, as alſo the Heart, Liver and Lungs, may be ſeen without diſſection; for as yet and for ſome days after, all the trunk of the Body lieth open before, ſo that the Entrails lie bare, the firſt rudiments of the Body beginning backwards and reaching forwards by degrees; even as Ship-carpenters begin with the Back or Keel of the Ship firſt, and raiſe up her Sides from thence. The Legs were not onely apparent at this time, but the Feet were alſo diſtinguiſhed into Claws, both which it could move. The form of it you have deſcribed in the *third* Figure of the following Table. *Sixth day.*

As for the *ſeventh* and *eighth* days, ſome buſineſs calling me out of Town I was prevented from making my obſervations on this brood of Eggs; but in others that had been ſat upon ſeven daies, I found no alteration from the appearances of the day foregoing, ſaving that every Part was more plain and compleat; as neither in others on the eighth day, ſaving that once in an Egg that had lain under the Hen but eight days, I could not ſee the Heart beat without a little diſſecting the Breaſt, which *Seventh and eighth days.*

was

was begun to close it self over it. The state of the Chicken on these daies you have delineated in the *fourth* and *fifth* Figures.

Ninth day. At the *end* of the *ninth* day (being returned home again) I broke another of the Eggs, and could not now discover the Heart, for the Chest was closed over it though but very loosely and imperfectly. (Though in another Egg broken at the same time, which another Hen had sat on, I could see the Heart move without dissection.) I perceived the Chicken to move its Legs, Wings and Head, and indeed all its Parts: Its Head was almost as big as all its Body besides; but especially its Eyes continued of a prodigious bigness, staring out of its Head: They were at least as big as small Pistol-bullets. The White of the Egg was a great part of it consumed already on the nourishment of the Chicken; and I could plainly see its umbilical Vessels now reach to the Yelk, which seemed as yet to have no part of it spent; its Parts were of different consistence, some thinner and some thicker; that was thinner wherein I could perceive the capillary Threads of the Navel-vessels to be dispersed. Both the Heart, Liver and Lungs were still of a whitish colour, and their Parenchyma had acquired no firmness of substance, though they had attained very near to their proper shape. The *sixth Figure* expresses the Chicken in the posture of this day.

Tenth day. At the *end* of the *tenth* day I examined another, wherein I found the Chest pretty firmly closed, but the *Abdomen* or lower Belly lay yet quite open, and the Stomach and Guts hung out of it. On its Back I discerned a great many blackish specks, which were the rudiments of the Feathers breaking out. The Eyes continued much in the same posture as on the day before, being as yet but very little drawn within their Orbits. Neither were the Brain and Cerebel as yet perfectly withdrawn to within the Skull. The White of the Egg was still more decreased, but the Yelk little or nothing diminished. Concerning which there is this one thing very remarkable; That though addle Eggs begin to stink and grow rotten by the warmth of the Hen, within four daies time from her first sitting on them, and every day encrease in their putrefaction the longer they are sat on: yet till this time the White that remains and also the Yelk in fruitfull Eggs, retain their proper smell and savour; yea the Yelk, that is not all of it consumed when the Chicken is hatched, (but is part of it received to within its Belly) I say what remains of it till then, tastes as sweet as the Yelk of a new-laid Egg. (But this by the way.) See the Chickens shape of this day in the *seventh* Figure.

Eleventh day. At *eleven* days *end* I broke another, and admired to see the Feathers so much encreased; for not onely those on the Back, which I observed breaking out the day before, were now become plain Feathers, but all its Body over almost was covered with the like. Its Abdomen lay yet open, and its Guts jetted out of it; but the Brain and Cerebel were now withdrawn perfectly within the Skull; but its Eyes stood gogling out still. One might discern its Rump also formed, and Feathers budding out of it resembling the Tail. But though the Chicken had attained to this maturity, yet neither this, nor that I examined the day before, lived so long as those on the two or three days before; but this I believe, happened through my chancing to wound the Navel-vessels in both, which caused them to bleed, and thereby I suppose hastned their death. The *eighth* Figure expresses this days Chicken.

All

All the Parts being now entirely formed, it would be but the repetition of the ſame things over again and again to give a particular account of each days proceeding, from the *twelfth* to the end of the *ſeventeenth*, till which time the Abdomen lies open ſtill: onely I ſhall give a ſhort account of ſome little alteration that happens in this interval; which is not ſo much in the Chicken it ſelf, as in the Liquors it is fed by, and in its umbilical Veſſels. Doctour *Harvey* ſays its umbilical Veſſels are five, three Veins and two Arteries. One of the Veins ariſes from the *Cava* above the Liver: this is the largeſt, and ſends forth its branches into the White, which being now in a manner ſpent, the branches of the Vein begin to wither, and by degrees are obliterated: But the other two Veins which ſpring from the *vena Portæ* continue longer, having their branches diſtributed into the Yelk, which as yet is but a very little of it conſumed. Theſe are accompanied by two Arteries that ſpring from the *Lumbares* or Loin-arteries. As the White is ſpent, the Membranes that contain'd it, begin to ſhrivel up and contract themſelves, and to cleave one to another, as the *Chorion* cleaves to the *Allantoides* in Viviparous Animals. The Chicken now having no Liquor to ſwim in (as it did whilſt the White remained) reſts its Belly upon the Yelk (which is drawn cloſer towards its *Abdomen* by the Membranes, ſtill more and more contracting themſelves) with its Head commonly under the right Wing. If one diſſect its Breaſt, one ſhall find its Heart and Lungs to have obtained almoſt their natural redneſs; but the Liver looks of ſomewhat a yellowiſh white. If one open the Head, the Brain hath acquired a pretty ſolid ſubſtance, whereas till of late both the Brain and Cerebel ſeemed to conſiſt of nothing but water. The Eyes continue ſtill to ſtand ſtaring out of their Orbits a pretty deal further than they do when the Chicken is hatched. Its gradual encreaſe in this interval, *viz.* on the *twelfth*, *thirteenth*, *fifteenth* and *ſeventeenth* days you have expreſſed in the *ninth*, *tenth*, *eleventh* and *twelfth* Figures of the following Table.

Twelfth day to the ſeventeenth.

On the *eighteenth* day the Guts are withdrawn to within the *Abdomen*, and together with them that which remains of the Yelk, from which the umbilical Veſſels continue to derive nouriſhment to the Chick, even after it is thus included in the Belly; yea, even after the Chicken is hatched: for it is not all ſpent till ſeveral days after. And this was a neceſſary proviſion of Nature, that ſeeing the Hen affords it no nouriſhment (as Viviparous Creatures do to *their* Young ones) but it muſt be its own Carver and feed it ſelf after the ſame manner as its Mother does; I ſay, Nature for this reaſon hath prudently provided, that it ſhould ſtill be nouriſhed by its umbilical Veſſels, till its Bill have acquired ſome ſtrength, and it have learned to pick for it ſelf. The largeſt umbilical Vein that is derived from the *Cava* and was diſtributed into the White, is now quite obliterated, the White being all of it conſumed. One may perceive the Chicken to buſtle about in the Egg, and if one hold it to his Ear, it may be heard ſometimes to peep, but more and more towards the twenty-firſt day, which is the uſual day of hatching; till which time from this eighteenth day it were to no purpoſe to give any Figure of what ſtate the Chicken is in, ſeeing, now that the *Abdomen* is cloſed, there would appear no Part but onely the ſurface of its Body which is all covered with Feathers. We ſhall ſpeak therefore no further of the manner and degrees of its generation, nor exhibit its daily condition in Figures, but onely add a word or two of its *hatching*.

Eighteenth day.

Three

How the Chicken is hatched.

Three weeks is reckoned the uſual and natural time for Chickens to be *hatched* in. At the one and twentieth day therefore, or at the longeſt on the two and twentieth the Chicken having ſpent all the proviſion Nature had provided for it in its little manſion; but more eſpecially wanting a freer Air to breath in, it begins to be uneaſie, and to meditate and endeavour an exit. It is to be noted that naturally there is in every Egg a little cavity in its broader end, which is filled (as I may ſay) with congenit Air: As the cavity encreaſes, this Air muſt needs be rarefied ſo as to fill up the empty ſpace; for the Shell ſeems of ſo denſe and compact a ſubſtance as to admit none of the external Air into it: or if we do ſuppoſe it to be ſo porous as that the outward Air can inſinuate it ſelf into it, yet will it not be ſufficient for ſo free a breathing as is neceſſary for our mature and full grown Animal; much leſs would that congenit Air, beforementioned, (ſo much rarefied as it muſt be) ſuffice for it. The Chicken hath however ſome ſort of reſpiration, or elſe it could not peep; for that voice muſt be formed by the Air in expiration. But I ſay it requires a freer breathing than this comes to; and therefore by ſcratching and pecking againſt the Shell, it ſtrives to break priſon. In doing which it hath no help from the Hen, (whatſoever ſome may affirm of her breaking the Shell for it) as Viviparous Animals afford to their Young, whoſe Wombs that contain the *Fœtus*, being moleſted by its tumbling, are excited to endeavour an expulſion; whence the birth is almoſt wholly owing to the Dam, that by her throes excludes her *Fœtus*, and to the *Fœtus* no otherwiſe than as by its motion it cauſes an uneaſineſs to the Dam. The Shell notwithſtanding (that is like an external Womb) is partly prepared for the eaſier exit of the Chicken; for by its having been kept warm ſo long by the Hen's brooding upon it, and by the White's being conſumed within it, it is now become dry and brittle, and readily admits of the impreſſions of the Chickens Bill pecking againſt it; and much more eaſily will the Membranes wherein it is inveſted (which may be called its Secundines) be penetrated and broken through by ſuch means. The Chicken then is wholly owing to its own pains for its excluſion out of the Egg; for by its Bill (as with a battering Ram) it demoliſhes and diſmantles the walls of its Priſon, and paſſing out through the breach obtains its freedom.

Hitherto it may ſuffice to have proſecuted this inſtance of the generation of an *Oviparous* Creature; it remains that in the next place we proceed according to promiſe, to give another inſtance of that of a *Viviparous* Animal; having done which we ſhall make a ſhort compariſon of the one with the other, and of both with the vegetation of the *Seed* of a *Plant*.

CHAP.

TAB. XLVI.

I

II

III

IIII

V

VI

VII

VIII

IX

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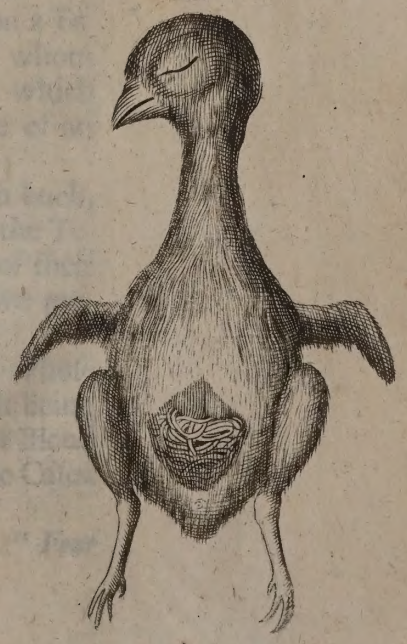
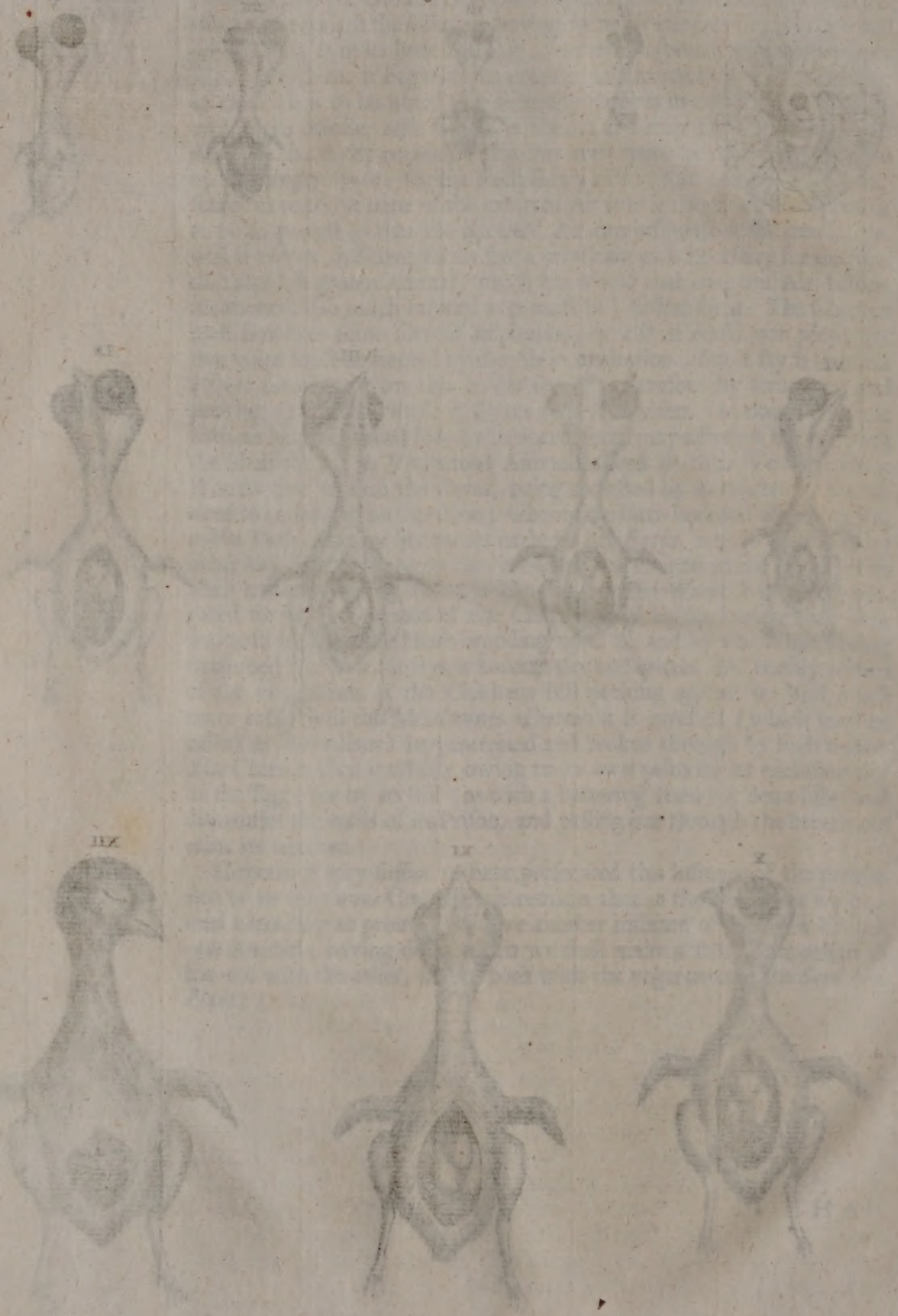
XI

XII





CHAP. IV.

Of the Generation of Viviparous Creatures.

HAving finiſhed the hiſtory of the generation of *Oviparous* Animals, we come in the next place to that of *Viviparous*, wherein we ſhall be the ſhorter, by reaſon there is that analogy betwixt them, that to be too particular would be tedious, ſeeing it were but to repeat the ſame things over again. For an *Egg* is as it were a *Conception without* the Body; and a *Conception* may properly enough be called an *Egg within* the Body. I have not had my ſelf opportunity to examine each days proceedings in the generation of this ſort of Animal (*viz.* of *Viviparous*) but have ſuch obſervations made to my hand by the curious *De Graef*, whoſe Inſtance is in Rabbets. His obſervations I ſhall make uſe of ſo far as they are for my purpoſe, omitting what is otherwiſe. But before I proceed to them, a few things are to be premiſed.

Firſt, Thoſe parts which we commonly call the *Teſticles* in Females are truly Ovaries, from whence the Eggs (one or more at a time) as they are impregnated with the Geniture of the Male, ſeparate, and being conducted into the Womb or its Horns, by the Trumpets, become there what we call a *Conception*.

Secondly, This Animal whoſe generation we inſtance in, forms its Conceptions not in the *bottom* of the Womb as a Mare and ſome other Creatures do, but in its Horns, into which it is preſently divided from the *Vagina* it ſelf, without any *fundus* or bottom at all.

Thirdly, A Rabbet going with young but ſo ſhort a while, it is to be ſuppoſed that all things even from the very firſt, proceed with ſo much greater haſte, as their geſtation is ſhorter than that of other Animals reſpectively.

Fourthly, A Rabbet is one of the *placentiferous* Animals, each *Fœtus* having its proper *Placenta*; whereas Mares and very many other Creatures have no *Placenta*, but inſtead thereof *Cotyledons*, as was noted in the Firſt Book, Chap. 28.

Having premiſed theſe things I now proceed to the obſervations.

"We made the firſt tryal (ſays the above-named Authour) on a Fe-
"male Rabbet that had not yet accompanied with the Male, in whom
"the Teſticles were ſmall, but contained very many limpid Eggs, which
"being cut open there iſſued out a clammy liquor like the White of an
"Egg.

"We opened another (ſays he) *half an hour* after ſhe had taken buck,
"the *Cornua* of whoſe Womb lookt a little redder, but the *Ova* in the Te-
"ſticles were not yet changed, unleſs they had remitted a little of their
"clearneſs: but neither in the *Vagina* nor in the *Cornua* could we per-
"ceive any Seed or any thing like it.

"About *ſix hours* after the coupling we diſſected another, in whoſe
"Teſticles the Caſes of the *Ova* inclined to redneſs, out of which being
"prickt with a Needle a clammy and clear Liquor iſſued firſt, but Bloud
"followed, flowing out of the Bloud-veſſels diſperſed through the Caſes.
"There was no Seed to be ſeen in this neither.

" *Four and twenty hours* after the coupling we opened another, in one " of whoſe Teſticles we found three, and in the other five Caſes of the " *Ova* very much changed; for being before the *Coitus* limpid and colour- " leſs, they were now turned duskiſh and of a faint red, in the middle of " whoſe Superficies a little *Papilla* (or Teat) as it were, diſcovered it " ſelf. When the Caſes were cut open, there appeared a little limpid " Liquor in their middle, and in their circumference a certain thicker and " reddiſh Matter.

" *Twenty ſeven hours* after the *coitus* we inſpected another, the *Cornua* " of whoſe Womb with the Oviducts or Trumpets looked more bloudy, " alſo the extremity of the Oviduct did on every ſide embrace the *Teſti-* " *cle* like a Tunnel. We found no Eggs in the *Cornua*, nor were their " Caſes in the Teſticles much altered from what they were three hours " before.

" *Eight and forty hours* after the coupling we examined another, in " one of whoſe Teſticles we found ſeven, in the other three Caſes chan- " ged, in whoſe middle the Teats were ſomething more eminent, through " which, by preſſing the ſubſtance of the Teſticles, there iſſued a little " liquor like the White of an Egg; but the remaining reddiſh ſubſtance " of the Eggs being now become ſomething thicker, was not ſo eaſily " preſſed out as before.

" *Seventy two hours* (or *three days* and nights) after the *coitus* we in- " ſpected another, in which was great alteration; for the end of the *In-* " *fundibulum* or Oviduct did embrace the Teſticles moſt cloſely, which " being pull'd off we found in the Teſticle of the right ſide three Caſes " a little greater and harder, in the middle of whoſe ſurface we ſaw a " little knot with a ſmall hole in it like a Nipple; but diſſecting theſe " Caſes through the middle, their Cavity was quite empty; wherefore " we ſearched the ways through which the Eggs muſt paſs, again and " again, and found in the middle of the right Oviduct one, and in the " outer end of the *Cornu* of the ſame ſide two very ſmall Eggs little big- " ger than ſmall Pins heads, which notwithſtanding their ſmallneſs are " cloathed with a double coat; out of theſe Eggs being pricked there if- " ſued a moſt clear Liquor. In the beginning of the left Horn we found " onely one Egg.

" The *fourth day* from the coupling we opened another, in one of " whoſe Teſticles we found four, in the other three Caſes emptied, and " in the Horns of the reſpective ſides, we found as many Eggs, greater " than the former, which did not ſtick in the Oviducts or beginnings of " the *Cornua*, but were now rolled on towards their middle; in their " Cavity we beheld as it were another Egg ſwimming, far clearer than " in the other before.

" The *fifth day* from the coupling we diſſected another, in whoſe Te- " ſticles we told ſix emptied Caſes, that had each a notable Nipple, " through whoſe hole we eaſily put an ordinary Briſtle into their Cavity. " We found alſo the ſame number of Eggs, bigger than thoſe on the day " before, in divers parts of the *Cornua*, in which they lay ſo looſely, that " by blowing onely, one might drive them this way or that way. The " inner Tunicle of theſe, (or the Egg within an Egg as it were) was be- " come yet more conſpicuous.

" The *ſixth day* after the *coitus* we examined another, in one of whoſe " Teſticles we obſerved ſix Caſes emptied, and in the *Cornu* of the ſame

" ſide

" ſide we could light of but onely five Eggs near the *Vagina* brought as " it were upon an heap; but in the Teſticle of the other ſide we found " four Caſes emptied, and in the Horn of that ſide onely one Egg. The " cauſe of which difference we ſuppoſe to be, either becauſe ſome Eggs " by the Wave-like motion of the *Cornua*, (not unlike the periſtaltick " motion of the Guts) being carried downwards towards the *Vagina* " were driven forth; or becauſe being conſumed in the Caſes they came " not to the *Uterus*; or light on ſome other miſchance. Theſe Eggs " were as big as ſmall Peaſe.

" The *ſeventh day* from the *coitus* we examin'd another, in whoſe Te- " ſticles we found ſome Caſes emptied that were greater, redder and " harder than the foregoing, and ſaw as many tranſparent tumours or " cells in divers parts of the *Cornua*; out of which being opened we turn- " ed Eggs as big as Pocket-piſtol Bullets, in which we could diſcern no- " thing but the inner Tunicle very plain and a moſt clear humour. It is " wonderfull that in ſo ſhort a ſpace of time the Eggs ſhould imbibe ſo " great plenty of liquor, that whereas before they might eaſily be taken " out of the Womb, now they could very difficultly.

" The *eighth day* after the *coitus* we opened another, in the right Horn " of whoſe *Uterus* we ſaw one, in the left two cells; one of theſe was " almoſt twice as big as the other: for Nature doth ſometimes ſo vary, " that there are Eggs of divers bigneſs found not onely in divers Animals " of the ſame ſpecies diſſected at the ſame diſtance from the *coitus*, but " alſo in one and the ſame Individual. In the Horns of the Womb being " opened we ſaw the Eggs a little bigger than the day before; but all of " them, their Tunicles breaking, poured out their clear liquor before we " could take them quite out: for which reaſon we tried another diſſected " likewiſe the eighth day after the *coitus*, to take out whoſe *Ova* we " uſed the greateſt circumſpection; but their Tunicles were ſo very ten- " der, that they burſt as the former: which when we ſaw, the Eggs " that remained we boiled with the Womb, whereby the liquor that was " in them harden'd like the Whites of Hens Eggs.

" The *ninth day* after the *coitus* we diſſected another that was old; The " Teſticles of this were almoſt as big again as thoſe of younger: In the " right we ſaw two, in the left five Caſes lately emptied; and beſides " theſe, others that lookt very pale, which we judged to be thoſe that " had been emptied the *coitus* before this, although for the moſt part " they leave onely ſome paliſh points or ſpecks, to which the increaſe " of the Teſticles is owing. The Caſes of the laſt *coitus* had each a Teat " upon them, but the others were ſmooth. In the right Horn there " were two, and in the left five Cells, whoſe ſubſtance being more rare " and clear than the other parts of the Womb, was interwoven with ma- " ny twigs of Veins and Arteries. Opening ſome of theſe Cells, we " could ſee the Eggs, but could not take them out whole; wherefore be- " ing compelled to examine the content of the Eggs in the very hollow " of the Cells, we found it clear like Cryſtal; in the midſt whereof a " certain rare and thin cloud was ſeen to ſwim, which in other Coneys " diſſected likewiſe on the ninth day after the coupling, for its exceed- " ing fineneſs eſcaped our ſight. The inner ſubſtance of the Cells, name- " ly that which receives the hypogaſtrick Veſſels, being more tumid " than the reſt, exhibited the rudiments of the *Placenta*.

" The *tenth day* after the *coitus* we inſpected another, in whoſe right Te-
" ſticle we found one Caſe alone emptied, which by reaſon of the Bloud-
" veſſels diſperſed plentifully through it was redder and had a leſs Teat;
" in the middle of it there appeared as yet a very ſmall Cavity: but in
" the left Teſticle we found ſix ſuch Caſes. In the Horns of the Womb
" we found alſo ſo many Cells, namely one in the right and ſix in the
" left, diſtant a finger's breadth one from another; in the midſt of which
" Cells lay a rude mucilaginous draught of the Embryo like a little Mag-
" got; one might alſo plainly diſcern the *Placenta*, to which the Egg by
" means of its *Chorion* was annexed. The liquor of the Eggs being boiled
" with the Womb hardned like the White of an Egg, and taſted like the
" boiled congealed ſubſtance of the Eggs in the Teſticles.

" The *twelfth day* after the *coitus* we opened another, in one of whoſe
" Teſticles we found ſeven, in the other five Caſes emptied, and as many
" Cells in the Horns much bigger and rounder than the foregoing, in the
" middle of which the Embryo was ſo conſpicuous, that one might in a
" ſort diſcern its Limbs, having two bloudy ſpecks and as many white
" ones in its Breaſt: In the Paunch there grew a certain mucilaginous
" ſubſtance inclining here and there to red. We could not diſcern more
" in this ſhapeleſs little Animal becauſe of its tenderneſs.

" The *fourteenth day* after the *coitus* we diſſected another, which had
" the Cells in the *Cornua* yet larger than the foregoing, and the Bloud-veſ-
" ſels more, and more turgid. We alſo noted that the Cells the larger
" they grew, came alſo nearer to one another, the ſpaces between them
" being ſhortned. The Membranes *Amnios* and *Chorion* were knit toge-
" ther, tearing which we ſaw an Embryo (ſuch as the eleventh Figure of
" the following Table repreſents) with a clear and pellucid head, with
" the Cerebel copped: its goggle Eyes, gaping mouth, and in ſome ſort
" its little Ears might be diſcerned alſo. There was a draught of its Back-
" bone, of a white colour, which bending in about the *Sternum*, reſem-
" bled the Keel of a Ship: By its ſides there run very ſlender Veſſels,
" whoſe Branches were extended to the Back and to the Feet. The two
" bloudy ſpecks in the Breaſt, being greater than the foregoing were the
" rudiments of the Ventricles of the Heart; at the ſides whereof were
" ſeen two whitiſh ſpecks for Lungs. In the Paunch being opened there
" firſt ſhewed it ſelf a reddiſh Liver, then a white body, to which was
" knit a mucilaginous matter like a writhen thread, being the rudiments
" of the Stomach and Guts: All which in thoſe that we diſſected after-
" wards, had acquired onely a greater bulk and perfection. And there-
" fore to prevent tediouſneſs by repeating the ſame things, we will on
" purpoſe paſs by all the other Diſſections we made in this kind of Crea-
" ture excepting onely one which we made the day before the kindling,
" that thoſe things that in the former were onely confuſedly diſcerned,
" may appear plain in this.

" At length on the *twenty ninth day* after the *coitus* we inſpected ano-
" ther that had kindled ſix weeks before, and in the *coitus* by which ſhe
" was impregnated had voided all the thicker part of the geniture of the
" Male, which in ſome meaſure did reſemble the conſiſtence of a moſt
" limpid gelly. In her Teſticles we found eleven little whitiſh Caſes;
" and beſides theſe, others far leſs, little or nothing differing from the
" ſubſtance of the *Teſtes*. Theſe Caſes of the Eggs in the Teſticles ſeem
" not to vaniſh wholly, but to leave a certain ſpeck in them; whence it

" certainly

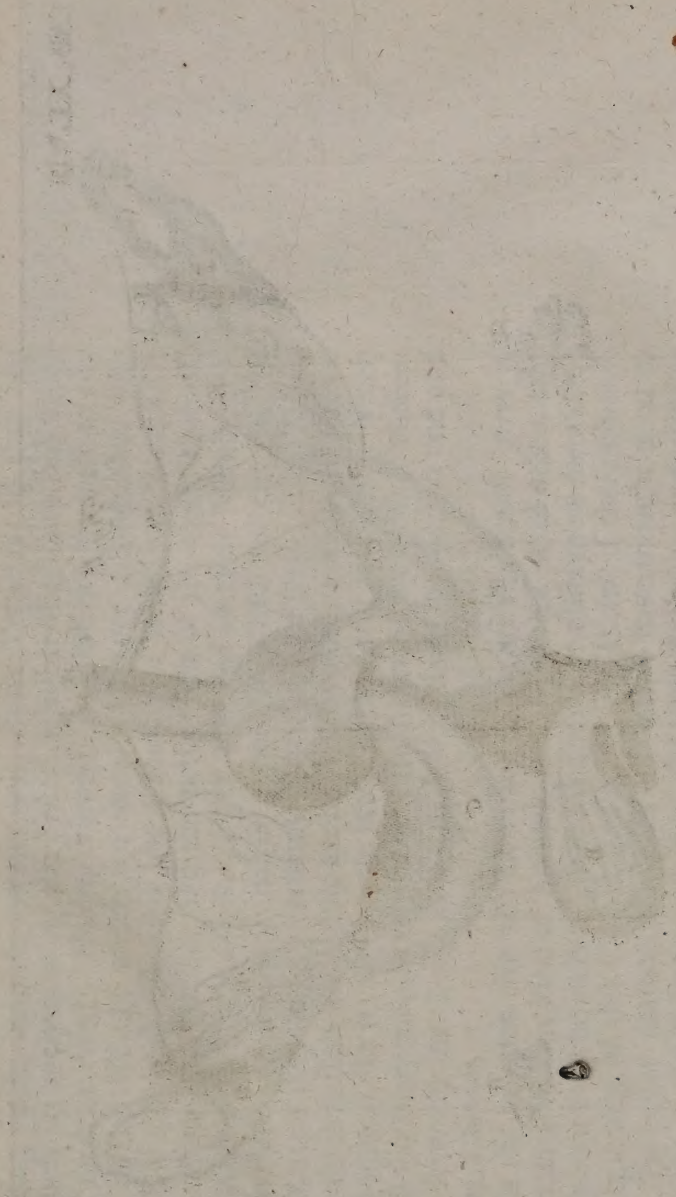


Fig. 1.

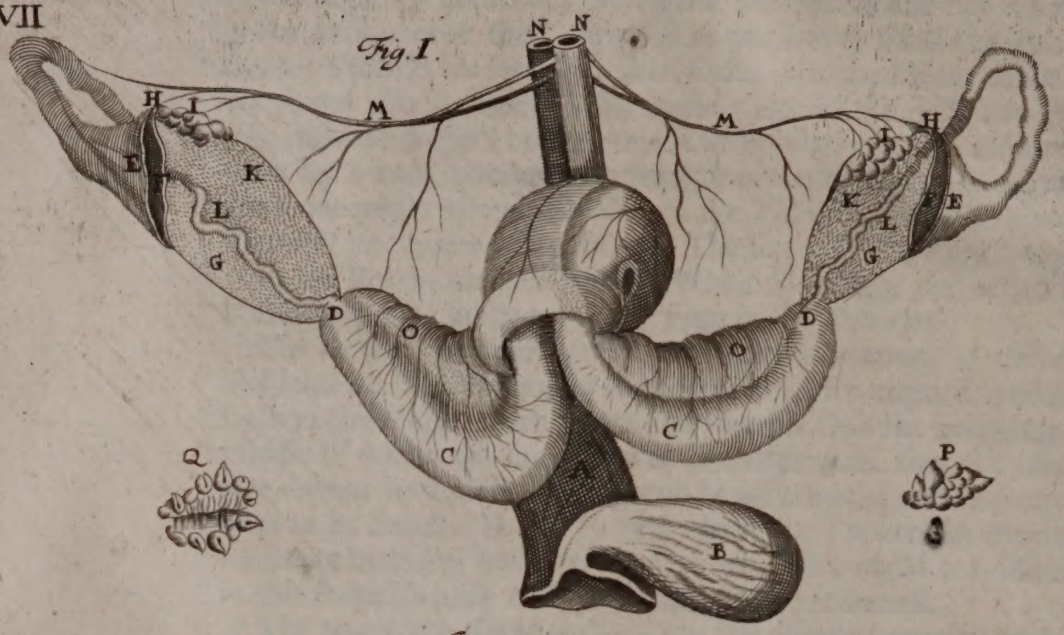
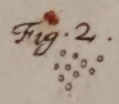


Fig. 2.



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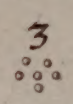

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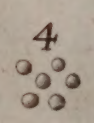

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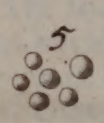

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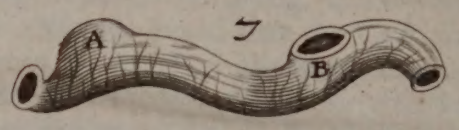

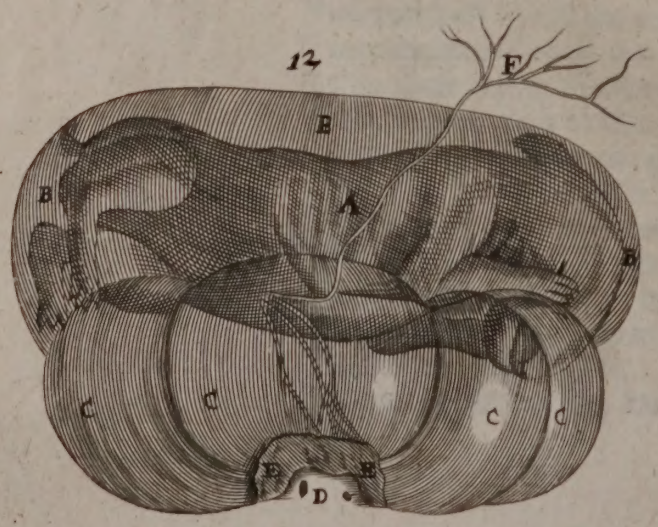

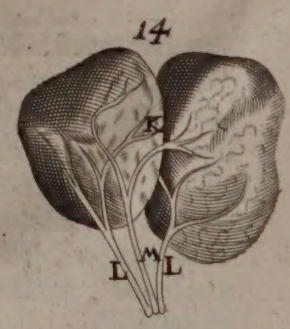

" certainly comes to paſs, that Conies the oftener or the more young ones " they bring forth, have the greater and whiter Teſticles; ſo that one " may gueſs by onely viewing the *Teſtes*, whether they have had many " young ones or often. Having viewed the Teſticles we paſt to the " Horns of the Womb, which we found no longer diſtinguiſhed into " Cells, but all along diſtended like a Pudding: which was ſo agitated " with a Wave-like motion, like the periſtaltick of the Guts, that the " young ones neareſt the *Vagina* as yet included in their Membranes, " were excluded, and that ſo haſtily, that if we had not cut out the " whole *Uterus* they had all certainly gone the ſame way. The Womb " was no thicker than when they are not with young, (otherwiſe than it " is in Women.) In its Cavity we ſaw eleven *Fœtus* ſprawling, which " were all ſo cloſely coupled together by the Membrane *Chorion* (wherein " all are ſeverally involved) as if they had all been included in one and " the ſame *Chorion*.

This is the account that the aforenamed curious Anatomiſt gives of the generation of this kind of Animal, and to *it*, that of all others that are *Viviparous* may be reduced, abating onely the differences mentioned at the beginning of this Chapter, or other like them, if there be any. And for the better illuſtration of this account, I have thought good to annex hereto a Table borrowed from the ſame Authour, expreſſing as well the figure of a Rabbet's *Uterus*, as the poſture or condition the Conception and *Fœtus* are in on each day whereon the foregoing obſervations were made.

Table XLV.

Repreſents the Genitals of a She-rabbet, the various figures of the *Ova* or Conceptions; as likewiſe a perfect Young one with its Secundines.

Figure I.

Shews the Genitals of a She-coney.

A a *The* Vagina.
B *The Piß-bladder.*
CC *The Horns of the Womb drawn forwards.*
DD *The beginning of the Oviduct where it ſprings from the Horn.*
EE *The extremity of the Oviduct, widening by degrees like a Tunnel.*
FF *The cavity of the Tunnel that encloſes the Teſticles.*
GG *The membranous Ligament that knits the Tunnel to the Horn of the Womb.*
HH *A portion of the Tunnel knit to the Teſticles.*
II *The Ovaries or Teſticles drawn upwards.*
KK *The membranous Ligament that knits the Ovary (or Teſticle) to the Horn of the Womb.*
LL *A moſt thin Membrane that goes betwixt the two Ligaments.*
MM *The Bloud-veſſels that run to the Teſticles.*
NN *Portions of the* Vena cava *and great Artery.*
OO *The hypogaſtrick Veſſels that are carried to the Womb.*

P *A Coneys Teſticle wherein two days from the* coitus *the Teats of the Caſes appear.*

Q *A Teſticle wherein on the third day from the* coitus *the thickneſs, and* Cavities *of the Teſticles (in which the Eggs were included) appear.*

Figure II. to XI. Shew the various figures of the Eggs or Conceptions.

Fig. II. Shews the Eggs as they are found in the Horns of the Womb on the third day from the *coitus.*

III. The ſame Eggs on the fourth day from the *coitus.*

IV. The ſame on the fifth day.

V. The ſame on the ſixth day.

VI. The ſame on the ſeventh day.

VII. The ſame on the eighth day forming Cells in the Horns of the Womb.

A *The Cell in the Horn of the Womb that contains the Egg.*
B *A Cell opened in whoſe Egg is found nothing but liquor.*

VIII. The Eggs on the ninth day from the *coitus.*

A *The Cell in the Horn of the Womb.*
B *A Cell opened in whoſe Egg there appears a thin cloud.*

IX. The Eggs on the tenth day from the *coitus.*

A *The Cell full of Bloud-veſſels.*
B *A Cell opened in whoſe Egg is ſeen an Embryo like a ſhapeleſs Maggot.*

X. The Eggs on the twelfth day from the *coitus.*

A *The Cell.*
B *A Cell opened in whoſe Egg there appear the lineaments of an Embryo.*

XI. The Eggs on the fourteenth day from the *coitus.*

A *The Cell.*
B *The Embryo with its* Placenta *and Umbilical-veſſels.*

Figure

Figure XII.

Shews the young Coney with its Secundines.

A *The Coney included in the Membrane* Amnios.
BB *The Membrane* Amnios *blown up.*
CC *The Urinary Membrane (or* Allantoides*) blown up, making divers Cells as it were.*
D Everhard's *glandulous Body, or the whitish part of the* Placenta.
EE *The ruddy part of the* Placenta.
F Needham's *Omphalo-mesenterick Vessels* (i. e. *Vessels that pass from the Mesentery to the Navel) running to the* Chorion, *which in this Figure is removed.*

Figure XIII.

Shews the back-side of the *Placenta* pull'd from the Womb.

HH Everhard's *glandulous Body having six or seven holes in it.*
II *The ruddy part of the* Placenta.

Figure XIV.

Shews the fore-side of the *Placenta* into which the Navel-vessels enter.

K *A line dividing the* Placenta *as it were into two parts.*
LL *The umbilical Arteries dispersed through the* Placenta *with divers branchings.*
M *The umbilical Vein likewise dispersed through the* Placenta.

CHAP.

CHAP. V.

Of the Analogy, or likeneſs, between the generation of Oviparous and Viviparous Animals; and how far the generation of both agrees with the vegetation of Plants.

SUppoſing, what has been demonſtrated by the foregoing diſcourſe, that the firſt principle of the *Fœtus* both of *Oviparous* and *Viviparous* Animals, is an *Egg*, and that the *Seeds* of Plants have analogy thereto, and may properly enough be comprehended under the ſame denomination; we ſhall as briefly as may be, conſider the correſpondence that one of theſe has to another in their procedure towards the production of a perfect Animal or Plant of their reſpective kinds.

As for *Vegetables*, the Sun is the common *father* of their whole *genus* or ſtock, for by his irradiation alone it is that any of their Seeds (or Eggs) are matured and become fruitfull: not but that the *Mother*-plant her ſelf produces the whole ſubſtance of the Seed; but its becoming fructiferous or vegetative, is owing wholly to the ethereal and moſt pure and ſubtil influence of the Sun. In like manner the *Matter* of the Eggs in *Oviparous* Animals, or of a Conception in *Viviparous* is derived onely from the Female, whoſe Egg or Conception it is; but the vegetative or plaſtick power reſiding therein is derived from the impregnation (or if you will, *irradiation*) of the ſpirituous geniture of the *Male*, by whoſe influence alone they are rendred capable of producing a *Fœtus* of their proper ſpecies.

The Seed, Egg or Conception then being indowed with a vegetative virtue by theſe means, have need of ſuitable nouriſhment for the encreaſe of the firſt lineaments and rudiments of that which is produced out of them. *Seeds* are emancipated from the Womb of their *natural* Mother the Plant, (*viz.* the Pod or Shell) and committed to that of their *Foſter*-mother, the Earth. Into which they are no ſooner received, but they begin to imbibe the nitrous and balſamick juices wherewith ſhe abounds, through their hulls or husks, by which they are made to ſwell and increaſe in bulk. And even juſt thus in *Viviparous* Animals, as ſoon as an *Ovum* is ſeparated from the Teſticle and arrives at the Womb, being cloathed with two Membranes (that anſwer to the husks of the Seed) it preſently begins to imbibe ſome of the albugineous liquor that plentifully bedews the ſides of the Womb at the time when a Conception is made: this liquor I ſay is imbibed through the Membranes, for as yet there is no Veſſel formed to convey it, nor does the Conception ſtick to any part. And thus alſo the little white ſpeck in an Hen's Egg, as ſoon as the vegetative virtue thereof is excited by the gentle warmth of the Hen brooding upon it, attracts unto it ſome of the thinneſt and pureſt of the White, whereby it is enlarged in its dimenſion. And this encreaſe happens to all three, before there are any the leaſt lineaments of that which afterwards is produced from them.

In the next place the Seed begins to put forth a gemm or ſprout, which is as the firſt *Embryo* of the Plant; and at the ſame time the Seed-leaf (which ſerves for the *Placenta*) and Navel-knot are ſhaped. By the Navel-knot, which knits the Seed-leaf and trunk of the Plant together, is nouriſhment conveyed from *that* to *this* for its further growth. In like manner the firſt thing that appears tending towards a *Fœtus* in an Egg or a Conception, is the red beating ſpeck and ſmall reddiſh ſtreaks proceeding from it, that prove the Navel-veſſels, which in Viviparous Animals that are placentiferous, are implanted into the *Placenta* or Womb-cake, from whence they derive nouriſhment to the Embryo. In Oviparous, that have no *Placenta*, they are inſerted into the Membranes that contain the White and Yelk, which Membranes 'tis probable may have ſome Glands adhering to them, through which the ſaid liquors are tranſcolated into the Navel-veſſels, and therefore may anſwer to the Cotyledons in ſuch Brutes as are not placentiferous. At the ſame time or preſently after appear ſome lineaments of the Spine, or trunk of the Body, anſwering to the trunk of the Plant.

The next progreſs of the vegetation of a Seed towards a Plant is the putting forth of Roots, which are as the Head and Mouth of the Plant, by which it ſucks nouriſhment all its life-long from its Nurſe-mother the Earth. In correſpondence whereto the firſt part (next to the before-mentioned) that attains to any conſiderable bulk or perfection of ſhape in the *Fœtus* of Animals, is the Head, which by the two laſt before-going Figures you may perceive both in Chickens and Rabbets to be at firſt well nigh as big as all the Body beſides. The reaſon of which *haſty* procedure in the formation of this part ſeems to be for two reaſons: *Firſt*, that the Brain whic his the ſpring of the Animal function, might arrive at a capacity of elaborating and tranſmitting the Animal Spirits, by the Nerves, to all the parts of the little Animal, for the performing of ſuch weak and imperfect motions as are neceſſary for it in that ſtate. And *ſecondly*, that its Mouth might be in a forwardneſs towards ſo much perfection as is neceſſary for the ſipping or ſucking and ſwallowing that albugineous nutritious juice wherein it fluctuates, and which its parts being now grown more bulky and firm begin to ſtand in need of for their further nouriſhment and encreaſe.

But now our *Fœtus* (whether the off-ſpring of a Viviparous or Oviparous Creature) being advanced beyond the ſtate and rank of Vegetables into that of Animals, we cannot deduce the parallel any further with that propriety and accuracy as hitherto: though it might ſtill be further proſecuted according to the moſt ingenious obſervations of Doctour *Grew* in his Anatomy of Trunks, who hath diſcovered in them not onely ſeveral Sap-veſſels anſwering to the Veins and Arteries (yea to the Milky-veſſels and Lympheducts) but Air-veſſels likewiſe, as if Plants were partakers of Reſpiration alſo, and conſequently of ſome degree of Animality, wanting onely local motion and (perhaps) ſenſe to difference them from true Animals. But to doe this would carry me beyond my purpoſe, which was to compare the *generation* (or rather firſt *vegetation*) of the one to the other, and not their after-*nouriſhment* and *life*. I ſhall therefore here break off the parallel or analogy of Vegetables with *Animals*; but ſhall continue a little further that of *Oviparous* and *Viviparous* Animals one with another.

By that time the purer part of the White of an Egg is the greateſt part of it exhauſted by the umbilical Veins, and ſpent in the encreaſe of the parts of the Chicken; its Bill, Mouth, Throat, &c. have attained to that perfection as that they can perform their office of ſipping and ſwallowing, whereby the remainder of the White, that is more thick and earthy, comes to be conſumed alſo. For that the Chicken ſwallows ſome of it, is plain, ſeeing if one open the Crop of one newly hatched, there is a clear liquor in it of the ſame conſiſtence, colour and taſte with the White, which can be conveyed thither no other way but by ſwallowing. In like manner the *Fœtus* of *Viviparous* Animals having arrived at ſuch maturity as to have their Mouths, Stomachs, &c. perfected, though they continue ſtill to receive part of their nouriſhment by the umbilical Vein, (even as a Chicken after it hath conſumed all the White, yet ſtill derives nouriſhment from the Yelk by other branches of the ſame Veſſel) yet partly that the Stomach may be initiated into that office it is to perform after the birth (*viz.* concoction,) and partly that the *Fœtus* may be trained up and accuſtomed to that way of feeding whereby they are to be ſuſtained after their expulſion from the Womb, they ſuck in at their Mouth a groſſer ſort of nutritious juice, (anſwering to the thicker White in an Egg) wherein they ſwim in the *Amnios*: which liquor is conveyed thither by the umbilical Arteries of the *Fœtus* in this manner. The umbilical Vein being implanted into the *Placenta*, or Cotyledons of the Womb, does imbibe therefrom that nutritious juice that is conveyed thither by the hypogaſtrick and ſpermatick Arteries of the Dam: which juice conſiſting of various particles is conducted to the *Fœtus*, with whoſe Bloud it mixes, and its purer particles are aſſimilated to it; but the groſſer and more earthy paſs from the *Fœtus* by its umbilical Arteries *towards* the *Placenta* or Cotyledons again; but in their way thither-ward they divert into thoſe branches of theſe Arteries that are diſperſed through the *Amnios*, and are ſpued out of their extremities into its cavity, where this liquor is collected in great quantity for the uſe aforeſaid.

Laſtly, when the Chicken hath ſpent all its proviſion, and is grown ſo big that it becomes uneaſie in its narrow Cloiſter, and likewiſe wants a freer air to breathe in, the Shell which is the Mother's (external) Womb, begins to be brittle and apt to chap, ſo that upon the Chickens buſtling about and pecking againſt it, it cracks and gives way to its Exit. Thus when the *Fœtus* (in *Viviparous* Creatures) is full grown, and the ſides of the *pelvis* permit not any further extenſion of the Womb, the *Fœtus* wanting Elbow-room as we ſay, tumbles about and creates an uneaſineſs to the Dam, and the Womb it ſelf is provoked to an endeavour to exclude its burthen which is now become troubleſome: whence partly from the endeavours of the Young to free it ſelf of its confinement, and partly by the ſtraining of the Dam (Nature having prepared the paſſage) the birth ſucceeds.

Thus I have proſecuted the hiſtory of the *Generation of Animals* from the firſt principles of their *Fœtus* till their bringing them forth; wherein I muſt confeſs to have borrowed much from other Mens obſervations: but as the Reader may have obſerved me ſo ingenuous as to mention my Authours where I have done ſo; ſo I hope it will be acknowledged I have produced ſome of my own, and improved thoſe I have borrowed to

to other purpoſes than they were firſt publiſhed to the world for by their Authours: wherein if there be any whoſe curioſity I have not ſatisfied, I hope there is at leaſt enough to excite his emulation, and to put him upon endeavours further to inform himſelf, and others. Either of which effects ſhall make me think the pains I have taken well beſtow'd.

SECTION II.

Of the Motion of the Chyle, and Circulation of the Bloud.

I Am now entring upon ſo trite a Subject, and which has exerciſed the Pens of ſo many learned Anatomiſts, that I cannot invite the learned Reader to the peruſal of this Diſcourſe with the promiſe of outdoing thoſe worthy Perſons that have gone before me: but the main inducement of the annexing this to the before-going Treatiſe, was from a proſpect that this Book will probably fall into the hands of ſuch as never read the before-mentioned Authours, ſo that this Doctrine will be as new to *them* as if never any thing had been writ before on the ſame Subject. But yet I would not ſo prejudice even the learned (Anatomical) Reader againſt it, as that he ſhould expect nothing but *Crambe recocta*, and ſo nauſeate and reject it: for beſide that the manner and method of the diſcourſe is (I think) new, he will find ſomething of Experiment, which (for any thing that I know) hath not been made by any other. However in the whole I ſhall be very conciſe, as having ſaid ſomething to the ſame purpoſe in the Firſt and Second Books, in the Chapters of the Stomach, Guts, and Meſentery, and of the Heart.

§. 1. *Of the motion of the Chyle.* In the firſt place we ſhall begin with the motion of the *Chyle*, becauſe *Chyle* is that out of which *Bloud* is made. *Chyle* is defined to be a *milky juice, like Barley-cream, prepared and concocted in the Stomach from the Food that is taken.* For when the Animal has chew'd his Meat ſufficiently, and thereby minced and prepared it, (in which action the *Saliva* or Slaver mixes with it) he ſwallows it down into his Stomach, which ſo contracts it ſelf, that be the Meat little or much, it embraces it cloſely, and keeps both its Orifices ſhut. The Meat being thus ſtew'd as it were by the mild heat of the Stomach, enters upon a fermentation, which proceeds from the acidity of the *Saliva* and the acid or acrimonious ferment of the Stomach working upon the *ſalt* particles of the Food and diſſolving or precipitating the ſame, (and together with them the *ſulphureous*) which being ſo diſſolved are diluted and turned into a fluid ſubſtance by the water or other liquor that the Animal drinks, and this is that we call *Chyle*. As for the other particles of the Food which are not thus diſſolved and made fluid, as being of a more groſs and earthy ſubſtance, they become like the Chymiſt's *caput mortuum*, and make that we call the *fæces* or Dung, which having once mentioned, my deſign will not give me occaſion to take much further notice of.

The

The *Chyle* then being thus prepared in the Stomach paſſes by degrees out at its lower Orifice into the Guts, along which it is gently conducted (together with the *fæces*) by their periſtaltick or Worm-like motion. Now into every one of the Guts are inſerted more or fewer of thoſe *Veins* which are called *milky*, from the whitiſh chylous liquor that is commonly to be found in them, and to diſtinguiſh them from the Bloud-veſſels that look of a bluiſh or dusky red. Theſe milky Veins being laid (as I may ſay) into the Guts like ſo many ſmaller (leaden) Pipes into a large Trunk, do every one of them imbibe or drink in part of the Chyle, and convey it whither and in what manner we ſhall ſhew preſently. The part that ſuſtains theſe Veins is the Meſentery, in whoſe folds the greateſt part of the Guts are gathered (all but the beginning of the firſt *(ſmall)* Gut, and laſt *(ſtreight)* Gut.) But as for the fabrick of theſe parts I would rather deſire the Reader to conſult the ninth, tenth, eleventh and twelfth Chapters of the Firſt Book, than be tedious with repetition. I ſay then theſe Veins being laid into the Guts, receive into their mouths the aforeſaid liquor through the ſpongie ſlime that bedaubs the inſide of the Guts, which ſerves as a ſtrainer for the confuſed maſs of the Chyle. But for the more eaſie ſeparation of its purer parts from the impure and feculent, there happens in the Guts themſelves a new kind of fermentation in the Chyle by the commixture of the bile and pancreatick juice with it, as was ſhewed in the aforeſaid Chapters and the thirteenth of the ſame Book. Now the reaſon why the Chyle ſhould rather divert into theſe ſlender Veſſels than continue its courſe down the wide Guts, is not from any magnetick or electrick attractive faculty in the Veſſels themſelves, but from the continual agitation and ſqueezing of the Guts partly by their own periſtaltick motion, and partly by their being heaved up and down by the continual motion of the Muſcles of the Paunch, and of the Midriff in Reſpiration. Theſe motions indeed haſten alſo the deſcent of the chylous maſs down the Guts themſelves; but he that conſiders the various windings of the Guts, and obſerves that the ſmall ones lie the greateſt part of them in the lower and fore-part of the Belly (into which moſt of the milky Veſſels are inſerted) whilſt the *Colon* (that lies more backward) aſcends up again as high as the bottom of the Stomach, and commonly is pretty full ſtuft with digeſted excrement of a pretty firm conſiſtence, muſt needs conceive it to be a very natural motion for the Chyle to regurgitate as it were, or ſlide into the milky Veins while the Inteſtins are thus compreſſed. And if this may be allowed for a ſufficient mechanical reaſon of its firſt entrance into them, we ſhall not need to be much thoughtfull for another, why it ſhould aſcend by *them* and the thoracick Duct to the Heart; ſeeing that which comes behind muſt needs drive on that which went before ſo far as there is paſſage for it, at leaſt ſo high as the place from which their deſcent was. For every body knows that any Aqueduct will convey the water as high as the Fountain or Well-ſpring where it receiv'd it, though in its paſſage from the Spring-head to the place where it is diſcharged, it deſcends through a valley that is (ſuppoſe) an hundred paces perpendicular lower than either. All Meat and Drink then being received in at the Mouth, it is no wonder that the Chyle that is made of it ſhould aſcend up as high as the Heart, though it firſt deſcend to the loweſt parts of the *Abdomen*, ſeeing the Heart comes ſo much ſhort of the height of the Mouth. But this motion of the Chyle that we are ſpeaking of, has a notable advantage above that of water

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in a Tree or Pipe; ſeeing water deſcends, and conſequently aſcends therein onely by its own *gravity*, and is aſſiſted in neither by the Veſſels that contain it: whereas the Meat and Drink are not onely *driven* down into the Stomach by the motion of the Throat and Gullet; but the upper mouth of the Stomach preſently cloſing upon them, hinders their aſcent back again, and the aforeſaid periſtaltick motion of the Guts, and reciprocal dilatation and contraction of the Belly (as well as Breaſt) in reſpiration, force the Chyle along the pipes it paſſes through, as well as it ſelf makes its way by its own weight. The milky Veins have alſo another advantage above an Aqueduct, in that they have Valves that hinder the relapſe or retreat of the liquor contained in them; ſo that upon whatſoever agitation or compreſſion of the Veſſels there is a way open for it forwards, but it cannot return back again.

The *Chyle* then being received into the Lacteals as aforeſaid, holds on its courſe in them through the Meſentery to the *common Receptacle* at the Loins. In this paſſage the *venæ Lacteæ* enter ſeveral glands of the Meſentery, out of which other branches ariſe again, and theſe alſo are inſerted into other glands, and other branches ſpring from them again, the branches themſelves likewiſe inoſculating one with another; but they all hold on forwards towards the great gland at the centre or root of the Meſentery where it adheres to the Loins, into which ſome enter and ſome march over it: But thoſe that enter it, ariſe again out of it, and joining with the others that ran over it, diſcharge themſelves all together into the *common Receptacle* before-mentioned.

This Receptacle is called *common*, becauſe it is common both to the Chyle and *Lympha* (which latter humour what it is, you may ſee in the above-cited twelfth Chapter.) It is ſeated behind and a little above the great gland at the centre of the Meſentery, rather towards the left ſide, by the ſide of the *Cava* deſcending, and near the left Kidney. It is like a little bag or bladder, and is nothing elſe but the wider part or root of the *thoracick Duct*, which is continued from it. All the Chyle being imported into this Receptacle, and alſo the *Lympha* returning from all the Bowels of the *Abdomen*, and the inferiour parts, mixing with and diluting of it, aſcend up the Loins and Back by the ſaid *thoracick Duct*, which is a long Pipe (very thin and almoſt tranſparent) running up the whole length of the *Thorax* under or behind the *Aorta* (on the inſide of the Spine) but rather inclining towards its left ſide; and at laſt paſſing under the *Thymus* it opens into the lower ſide of the left ſubclavian Vein, over againſt that place where the left jugular Vein opens into it on the upper ſide. Though the Duct uſually be but one, yet it opens with five or ſix mouths into the ſaid Vein, all which on the inſide the Vein are covered with one broad valve, which permits the Chyle and *Lympha* to enter into the Vein, but hinders either them or Bloud to ſlide out of the Vein into the Duct. This Duct has ſeveral Valves in it as well as the Lacteals of the Meſentery that hinder the retreat of the humours contained in it. You have this Duct with the Receptacle, *&c.* expreſt in the next Table but one, *viz.* the forty ninth and laſt.

Thus the Chyle being diſcharged into the Subclavian Vein is therein mixed with the Venal bloud, and paſſes along with it to the right Ventricle of the Heart, where it begins to be alter'd into Bloud. We cannot therefore purſue its motion any further under its own name: for though it be not perfectly turned into Bloud, it may be, in ſeveral times paſſing through

through the Heart in its circulation with the Bloud; yet it is so jumbled and mixt with the Bloud, that it is esteemed to be of the same mass with it. So that we shall leave it here, and onely advertise this further, that according to the strictest examination and most accurate experiments of the best Anatomists, all the Chyle passes these ways we have described, and no part of it is conveyed either to the Liver or Spleen, nor yet to the Womb in the time of its Gestation, or to the Udder in giving suck; I mean immediately and by proper Vessels; for it does indeed pass thereto, some part of it, by the Arteries, being confounded with the Bloud, from which it is there separated again, for the nourishment of the *Fœtus* or Young, as was shewed at large in the twenty eighth and twenty ninth Chapters of the First Book.

§. II. *Of the circulation of the Bloud.*

That the *Bloud* is continually some of it issuing from, and other some returning to the Heart, by a *circular* motion, is now an opinion so generally entertained, that I need not take any pains to prove *That* it is so, but shall onely shew *How* and by what *Ways* this motion is performed.

Its passage from the right to the left Ventricle of the Heart.

In the foregoing Paragraph we had traced the Chyle to the *right* Ventricle of the Heart, into which it enters mixed with the venal Bloud in the Heart's *diastole* or dilatation. Herein the Chyle and Bloud are more intimately mixed one with another, and 'tis probable enter upon some degree of fermentation, but it cannot be much, considering their short stay therein, which is but during the interval betwixt the dilatation and the contraction that next succeeds it: for by the following *systole* is all that Bloud and Chyle expelled out of the Ventricle into the pulmonary Artery, that was imported into it from the *Cava* by the foregoing *systole*. These humours then, which from henceforward we shall speak of under the notion of *Bloud onely*, being entred into the *pulmonary Artery*, are conveyed by its two branches into both Lobes of the Lungs; the smaller twigs of which branches inosculating with the like twigs of the *pulmonary* Vein transfuse the Bloud into them, which by this latter Vein is conducted to the left Ventricle. The Bloud in its passage through the Lungs being inspired or impregnated with the nitrous particles of Air received into the Lungs in Inspiration and there insinuating themselves into the Bloud, undergoes a greater fermentation in the left Ventricle than it had done before in the right, though it make no longer stay in the one than in the other. For the *systole's* and *diastole's* of both Ventricles are performed at the same time, and therefore the interval or cessation betwixt these two motions is equal. In the next *systole* therefore of the Heart the same Bloud is driven forth of this left Ventricle into the *Aorta* or great Artery, which is the root of all the Arteries in the Body (except the pulmonary.) I shall not need here to describe the Valves at the orifices of the Ventricles, which hinder the recourse of the Bloud *into* them (such are those of the pulmonary Artery and *Aorta*) nor those that hinder the regurgitation of the Bloud *out of* them into the *Cava* and pulmonary Vein; for of these we have spoken enough in the eighth Chapter of the Second Book: but we shall proceed to trace the course the Bloud further takes, now that we have follow'd it as far as the beginning of the *Aorta*.

Its passage from the left Ventricle to the habit of the Body.

The Heart is the Authour of the motion of all the humours that have once past it, be they Bloud, *Lympha*, Choler, the nervous Juice, or any other. For the Heart (like a Pump) ejecting the Bloud forcibly out of it, and that Bloud which comes behind still driving forward that which

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goes before, and having all other humours either formally or materially in it; as new ſupplies are conveyed by it or along with it to any part, that which was in the part before the ſupply came, muſt give way to it and hold on its courſe, till either it be ejected out of the Body if it be an excrement, or be returned back again to the Heart if it be a profitable Humour, abating ſo much of it as is ſpent on the nouriſhment and refection of the parts, or may evaporate by inſenſible tranſpiration. More particularly: The *Aorta* having received the Bloud from the left Ventricle is preſently divided into two *Trunks*, the *Aſcending*, and the *Deſcending*.

The Aſcending Trunk of the Aorta.

The *Aſcending* Trunk climbing up by the Wind-pipe to the top of the Breaſt ſends forth two branches, called the *ſubclavian*, becauſe they run *under* the lower ſide of the *claviculæ* or Chanel-bones. Theſe ſend out ſeveral branches both from their *upper* and *lower* ſide. From their *upper* ſide ſpring thoſe Arteries called *Mammariæ* (in Men) the *Cervical* (that are partly ſpent on the Muſcles of the Neck, and afterwards entring to within its *Vertebræ*, aſcend into the Brain by that hole by which the Spinal Marrow deſcends from it) and laſtly the *Muſculæ* (that are alſo beſtow'd on the Muſcles of the Neck.) Out of their *lower* ſide proceed the *ſuperiour Intercoſtals*. After having ſent forth theſe branches, they paſs out of the Cheſt to the Arms (or Fore-legs in Brutes) on the parts whereof they are beſtowed. Juſt where the great aſcending Trunk of the *Aorta* ſends forth the ſubclavian Arteries ſide-ways, it is divided into two large branches (called the carotid Arteries) that aſcend directly upwards, which firſt ſending ſome ſmall ſlips to the Tongue, the Muſcles of the *Os hyoides*, &c. are afterwards each ſubdivided into the *External* and *Internal* branches. The *External* are beſtowed on the Muſcles of the Lips, Cheeks, Temples, &c. The *Internal* entring the Skull at the hole by which the wandring pair of Nerves (or *eighth* pair) come out of it, are diſperſed through the Brain, the *dura* and *pia mater*, in which they make the *Rete mirabile* and *Plexus Choroides*, uniting with ſome twigs of the cervical Arteries before-mentioned. The Bloud that flows by theſe Arteries to the Brain, &c. after it hath ſerved the neceſſities thereof, returns back again towards the Heart by the *Jugular* Veins, which are alſo *External* and *Internal*, obſerving the ſame courſe with the Arteries. The *External Jugular* is that which appears ſo fair in the Neck, which we commonly open in Horſes. And here it may be convenient to inquire in what manner the Bloud paſſes out of the Arteries into the Veins, whether by inoſculating the one with the other, or by what other way. That I might ſatisfie my ſelf herein I made the following Experiment.

An Experiment to prove, that there are no Anaſtomoſes of the Arteries with the Veins.

Having bled an Horſe to death, that both Veins and Arteries might be empty, with the greateſt diſpatch I could, whilſt the Horſe was warm, I took up one of the carotid Arteries and cut an hole in it pretty near the Breaſt, into which hole putting a quill I blew into it as hard as I could, whereupon I perceived the branches of Arteries on both ſides of the Face, &c. to ſwell, yea and alſo the carotid Artery on the other ſide of the Neck: but I no ſooner left off blowing, but they were immediately emptied again, the wind, 'tis likely, proceeding forward, on the contrary ſide, towards the Heart. Upon which I tyed the Artery on the other ſide about the ſame place where I had made the hole on this, to ſtop the progreſs of the wind, and then blew again; upon which the Arteries on both ſides were very much diſtended: and then I ſpeedily made a ligature a little above the Orifice, whereby the Arteries and all their branches

branches in the Neck, Face, &c. continued diſtended. Which having viewed a-while, I took off both the Ligatures one after the other, and perceived the wind to retire both ways, and to leave the Arteries and all their branches empty. But all this while the jugular Veins were not ſwelled at all: upon which I made this concluſion, That the Arteries did not inoſculate with the Veins at all, but onely with one another. In which opinion that I might be further confirmed, I afterwards took up the external jugular Vein on one ſide, making a hole in it, and tyed the ſame Vein on the other ſide; I put my quill into the orifice I had made, and blew into it as I had done into the Artery before; whereupon the jugular Vein on the other ſide of the Neck ſwelled as well as that on this ſide, and both their branches about the Face, &c. As ſoon as they were all well filled, I made a ligature above the orifice, whereby the Air was pent in, and both Veins and their branches continued to be ſwell'd till I unlooſed the Ligatures, upon which they preſently became empty. But by thus blowing into and filling the Veins, the Arteries were not at all moved, which further ſatisfied me, that there are no Anaſtomoſes between the Veins and Arteries, by which the Bloud ſhould paſs out of theſe into thoſe or out of thoſe into theſe; but that ſuch are onely to be found amongſt Veſſels of the ſame kind. I ſpeak as to the *habit* of the Body; for that there are ſuch in ſome of the Bowels, as particularly of the pulmonary Artery and Vein in the Lungs, of the ſplenick Artery and Vein in or near the Spleen, and of the *Porta* and *Cava* in the Liver (the firſt of which from its double coat may be eſteemed rather an Artery than a Vein) is paſt diſpute. It may be wondred then, if indeed there be a circulation of the Bloud, how it ſhould paſs out of the Arteries into the Veins, if there be no communication by inoſculation betwixt them. But we muſt conſider that in living Bodies all the parts are much more porous and ſpongie than in a dead Carcaſe; for upon the ceſſation of the motion of the humours many of the ſmaller paſſages by which they uſe to be conveyed, are ſtopt by the coinciding of their ſides. So that although, according to the Experiment, there is after death no paſſage even for wind out of the Arteries into the Veins, nor on the contrary out of the Veins into the Arteries; yet in living Bodies it is not, from hence, neceſſary to deny it. For though we cannot grant any inoſculation of the one with the other (in the habit of the Body, as was aboveſaid;) yet there is another way whereby the humours may be transfus'd out of one into another, and that is thus: The Arterial bloud by the pulſation of the Heart is extravaſated or driven forth of the utmoſt ends of the Arteries into the very ſubſtance of the parts; which being rare and porous permits the Bloud to flow in; but the pores being very ſtrait can contain but a ſmall quantity, and therefore ſeeing the influx of the Bloud is continual, there muſt alſo be a continual efflux or diſcharge of the ſame, for which office there are no other Veſſels adapted but the Veins, which by their extremities imbibe or ſuck up the Bloud being thus extravaſated, and convey it back into the larger branches, and theſe diſcharge it into the *Cava*, and that, to the Heart. Now that the Bloud is extravaſated out of the Arteries into the ſubſtance of the parts is very certain, ſeeing if it were not ſo, the parts could receive no nouriſhment from the Bloud; for while it is in the Veſſels, it may indeed contribute warmth to the parts through which it flows, but it cannot nouriſh them, ſeeing even the larger Veſſels themſelves are not nouriſhed by that ſtream of Bloud

that glides along their cavity, but by capillary Veſſels running along their coats. Againſt this manner of the Blouds paſſing out of the Arteries into the Veins I know nothing can be objected, unleſs it be the haſty circulation of the Bloud, which according to the computation of the moſt accurate Anatomiſts is ſuppoſed to be ſo quick, as that the whole maſs of Bloud paſſes ſeveral times through the Heart in one hours ſpace: from whence ſome think it neceſſary to admit of *Anaſtomoſes* of the Arteries with the Veins all the Body over, whereby the Bloud may run in a fuller current out of one into the other, than 'tis probable it can do by way of extravaſation; though from the nutrition of the parts, they believe it neceſſary to admit this latter way too. To this objection I ſhall onely oppoſe the before-going Experiment, which to me ſeems a plain demonſtration that there are no ſuch *Anaſtomoſes* at all. Having therefore ſhewn all the branches of the *Aſcending* Trunk of the *Aorta*, we ſhall proceed to thoſe of the *Deſcending*.

The Deſcending *Trunk of the* Aorta.

The *Deſcending* Trunk of the *Aorta* is larger than the *Aſcending*, as being to ſupply more parts with heat and nouriſhment. It deſcends by the Gullet towards the Midriff, at which before it arrive, it ſends forth the *inferiour Intercoſtal* branches, and the *Bronchial*, which latter accompany the branches of the Wind-pipe in the Lungs. When it arrives at the Midriff, there ſpring out of it, the Phrenick Arteries, which are diſperſed through the Midriff, and *Mediaſtinum* or Partition-membrane of the Cheſt. Having pierced the Midriff, it deſcends in one Trunk as far as the laſt *Vertebra* of the Loins, but by the way ſends forth many branches: as firſt the *Cœliaca* or *Stomach* Artery, which ariſes ſingle, but is divided afterward into its *right* and *left* branches. The *right* furniſheth the right ſide of the Stomach, (*viz.* the *Pylorus*) the inveſting Membrane of the Liver, the Gall-bladder, the right ſide of the Caul and that part of the *Colon* on which it cleaveth, the beginning of the ſmall Guts, and the Meſentery: The *left* (called its *Splenick* branch) ſends ſome twigs to the middle part, left ſide and upper orifice of the Stomach, and to the left part of the Caul; but the greateſt part of it runs to the Spleen, into which before it enters, it ſometimes ſends forth the *vas breve arterioſum*, which goeth to the left part of the bottom of the Stomach: but in Horſes this *vas breve* ſpringeth from it after it is entred into the Spleen, as may be ſeen in the ſeventh Table annexed to the ſixteenth Chapter of the Firſt Book, where all theſe branches of the ſplenick Artery are delineated. The Veins that accompany this Cœliack Artery are branches of the *Porta*, and have the ſame names with thoſe of the Artery. Next to the Cœliack there ſprings out of the Trunk of the *Aorta* the *upper Meſenterick*, that is beſtowed upon the upper part of the Meſentery and the ſmall Guts. The next are the *Emulgent* Arteries, the right and left; each of which dividing themſelves into two or more branches, enter into the Kidneys of their reſpective ſides, and diſcharge there the *ſerum* or wheyiſh part of the Bloud that makes the Urine. Below theſe the *Aorta* ſends forth the *ſpermatick* Arteries, which in Horſes are commonly two, and in Mares oft-times more, on each ſide. Theſe run to the Teſticles, Womb, *&c.* Then the *lower Meſenterick*, that go to the lower part of the Meſentery and to the great Guts. By this time the Trunk of the *Aorta* being come to the top of *Os ſacrum*, having thus far deſcended under the *Cava*, begins to climb upon it, and is divided into two equal branches, called the *Iliack*; which are preſently ſubdivided into the *interior* and *exterior*. From the *interior* ſpring the *Muſculæ*, or

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Muſcle-arteries, being beſtowed on the *Pſoas*, the Buttock-muſcles, *&c.* alſo the *Hypogaſtrick*, that run to the parts of Generation in both Male and Female, and alſo to the Bladder, *&c.* and laſtly the *Umbilical* Arteries, which in the *Fœtus* aſcending by the ſides of the Bladder, proceed to the Navel, and run to the Womb-cake or Cotyledons; of which in the twenty eighth Chapter of the Firſt Book. From the *exterior Iliack* branches ariſe *firſt* the *Epigaſtrick* Arteries, which turning upwards run on the outſide of the Rim of the Belly, betwixt it and the ſtreight Muſcles, as far as the Navel, and there meet the *Mammary*. Secondly, the *Pudendæ*, which are ſpent upon the Privities of both Male and Female. Afterwards the *Iliack* branches deſcend to the Thighs, and then begin to be called *Crural*.

Thus we have given an hiſtory of all the larger branches of the *Aorta*, whereby the Bloud is conveyed from the Heart to all the parts of the Body; it would not be very material to give the like of the *Veins*, ſeeing every one of theſe Arteries has a Vein accompanying it, for the moſt part of the ſame denomination; ſo that by knowing the Artery that comes to any part, we muſt know the Vein alſo that returns the Bloud from it, eſpecially in the Limbs and outward parts. For indeed within the Body, eſpecially in the *Abdomen*, there is ſome variation: the rather becauſe ſome of the Veins thereof ſpring from the *Cava*, and others from the *Porta*. This latter ſupplies the Bowels that perform the firſt concoction, as the Stomach, Guts and Meſentery; as alſo the Spleen, Sweetbread, Caul, and the Liver in part. Theſe branches of the *Porta* receiving into them that Bloud that is ſuperfluous to the nouriſhment of thoſe parts into which they are inſerted, unite into one Trunk in the lower or *under* ſide of the Liver; which Trunk ſpreading it ſelf into many roots through the whole ſubſtance of the Liver, does transfuſe its Bloud into the like roots of the *Cava* that ariſes out of the *upper* ſide. In which paſſage of the Bloud out of the *Porta* into the *Cava*, the Bile is ſeparated from it. But that Bloud which is received *immediately* by the branches of the *Cava* diſperſed to the other parts of the Lower Belly, as alſo by thoſe that run to all other parts of the Body, whether from its Aſcending or Deſcending Trunk, paſſes through no Bowel in its return towards the Heart: But being imbibed by the capillary twigs out of the pores of the parts, is conveyed firſt into the ſmaller branches, and from them into the larger, and laſtly from theſe into one of the great Trunks of the *Cava*, by which it is poured again into the right Ventricle of the Heart, there to be inſpirited anew and ſent about in a ſecond circulation.

Table XLVIII.

Repreſents all the ſanguiferous Veſſels of the whole Body of an Horſe as well Veins as Arteries, as alſo the ſeveral Bowels through which they paſs.

A *The Aſcendent Trunk of the great Artery.*
B *The Deſcendent Trunk of the ſame.*
C *The Aſcendent Trunk of the hollow Vein.*
D *The Deſcendent Trunk of the ſame.*
EEEEEE *The diviſion of the Aſcendent Trunk of the great Artery into the Carotid and Cervical Arteries which go to the Neck and Head; as alſo into the Subclavians which go down the Fore-legs; likewiſe into the Mammary branches, ſo called in Humane Bodies, though improperly in Horſes or Mares.*
FFFF *The branchings of the Aſcendent Trunk of the hollow Vein into the external and internal Jugulars, and into the Subclavian branches.*
GGGG *The branchings of the Deſcendent Trunk of the great Artery into the Iliack, Epigaſtrick, Hypogaſtrick and Crural branches.*
HH *The like branchings of the Deſcending Trunk of the hollow Vein.*
I *The Heart in its natural poſition.*
KK *The Lungs in the ſame.*
L *The Liver in the like.*
M *The Spleen alſo in its place.*
NN *The Meſentery turned on one ſide.*
OO *The Kidneys.*
pp *The Deputy-kidneys.*
QQ *The Ureters.*
RR *The Spermatick Veins.*
SS *The Spermatick Arteries.*
TT *The Teſticles.*
VV *The deferent or ejaculatory Veſſels.*
WW *The cremaſter Muſcles.*
X *The Bladder of Urine.*
YY *The proſtate Glands.*
ZZ *The ſeminal Bladders.*
aa *The body of the Yard.*
b *Its* Glans.
cc *The Emulgent Veins.*
dd *The Emulgent Arteries.*
eee *The Meſenterick Veſſels.*

TAB. XLVIII.

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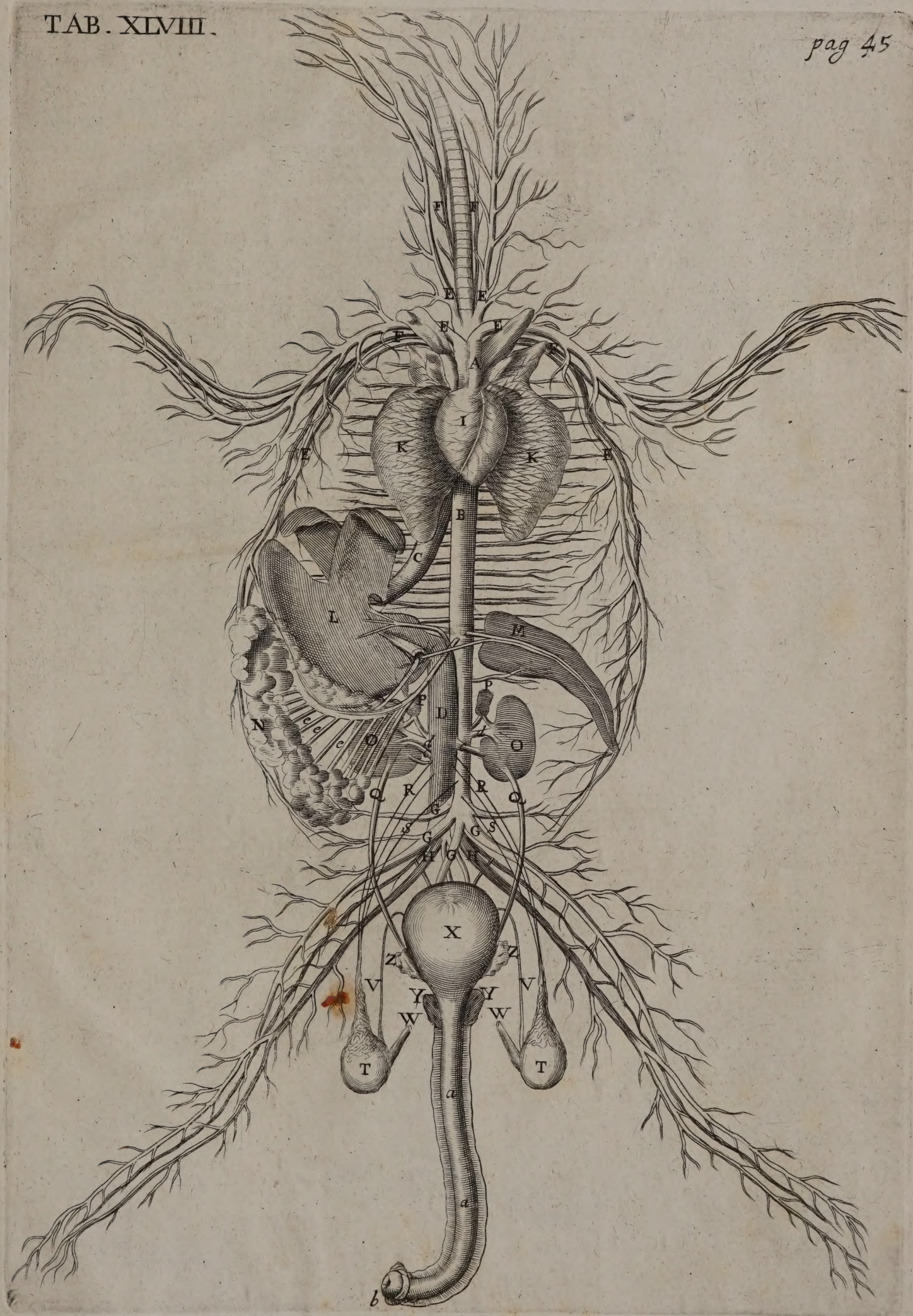

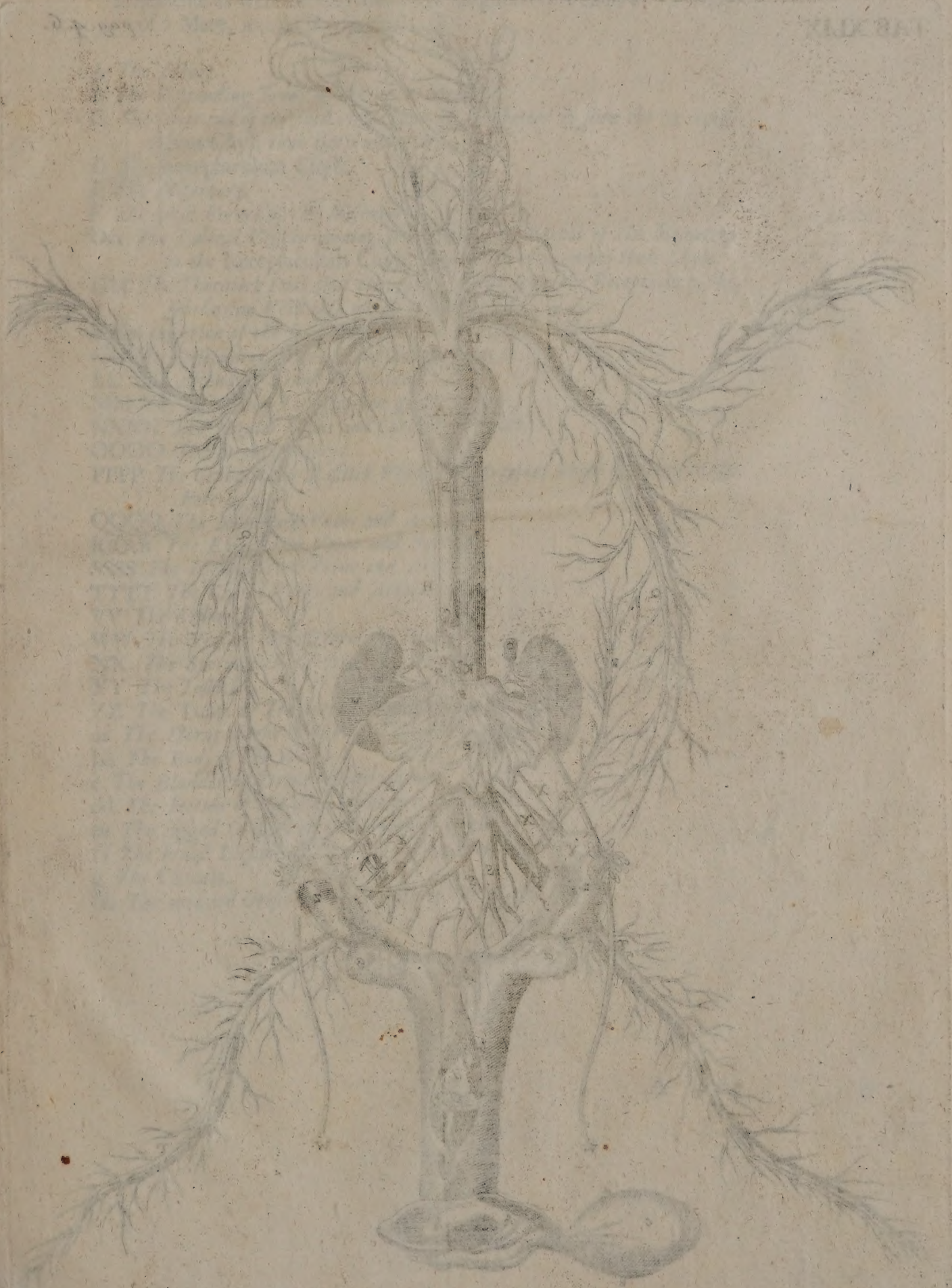

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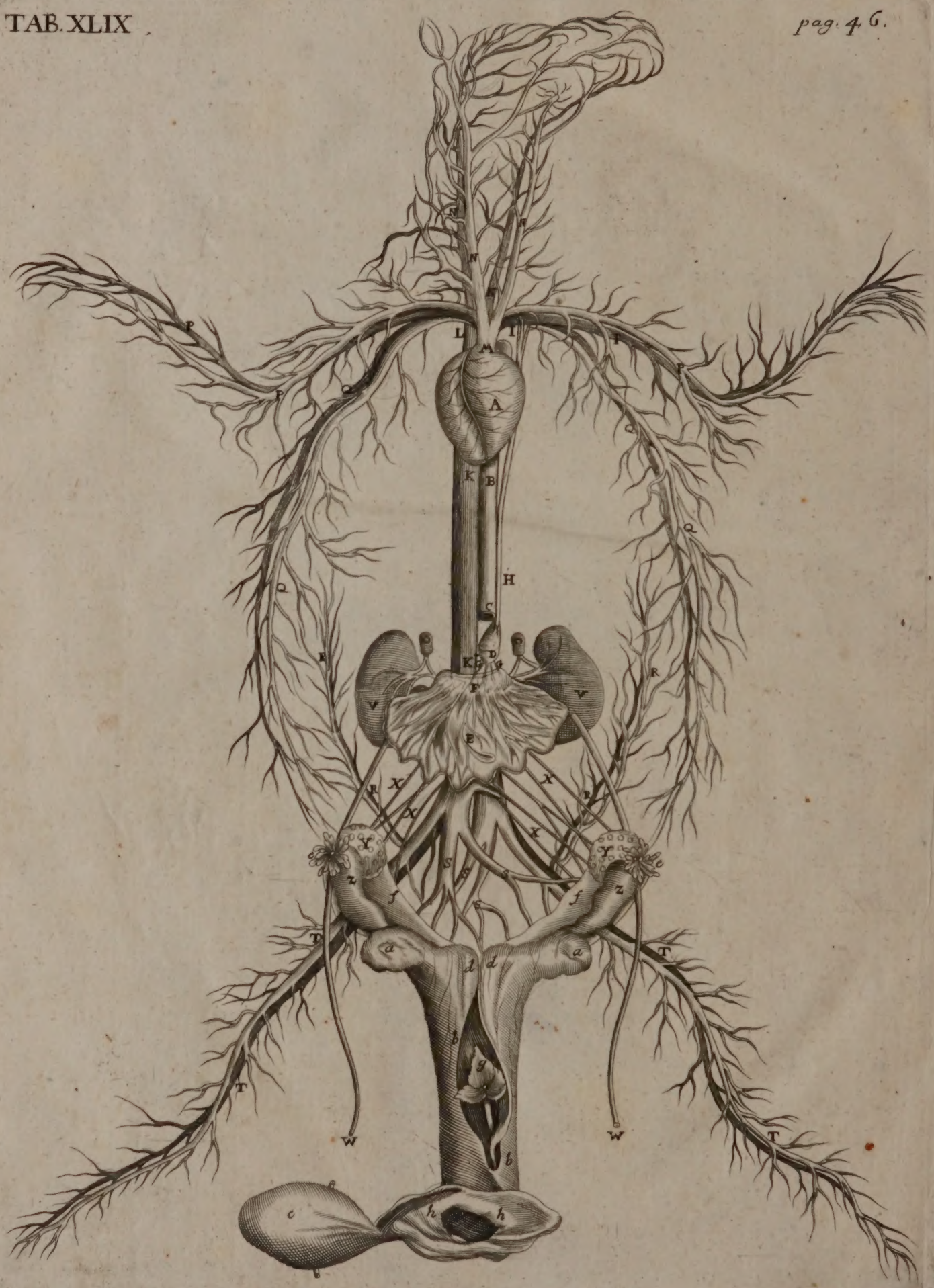

Table XLIX.

Repreſents as well the Chyliferous as Sanguiferous Veſſels of the Body of a Mare, as alſo her Genitals, *&c.*

A *The Heart.*
B *The Deſcending Trunk of the great Artery.*
C *The lower end of the ſaid Artery cut off, the better to ſhew the* Receptaculum Chyli *that lieth under it.*
D *The* Receptaculum Chyli.
E *The Meſentery.*
F *The great Kernel of the Meſentery.*
GG *The Lacteal Veſſels running from the great Kernel of the Meſentery to the* Receptaculum Chyli, *into which they empty their Chyle.*
HH *The Thoracick Duct that conveys the Chyle from the Receptacle to the ſubclavian Vein into which it is emptied.*
I *The inſertion of the ſaid Duct into the ſubclavian Vein.*
KK *The Deſcending Trunk of the hollow Vein.*
LL *The Aſcending Trunk of the ſame.*
MM *The Aſcending Trunk of the great Artery.*
NNNN *The Jugular Veins and Carotid Arteries.*
OOOO *The Deputy-kidneys.*
PPPP *The Cephalick or Baſilick Veins and Arteries which branch into the Fore-legs.*
QQQQ *The Mammary Veins and Arteries.*
RRRR *The Epigaſtrick Veins and Arteries.*
SSSS *The Hypogaſtrick Veins and Arteries.*
TTTT *The Crural Veins and Arteries.*
VV *The Kidneys.*
WW *The Ureters cut off from the Bladder.*
XX *The Spermatick Arteries and Veins.*
YY *The Teſticles.*
ZZ *The* Tubæ *or Trumpets of the Womb.*
aa *The Horns of the Womb.*
bb *The Body of the Womb.*
c *The Bladder of Urine turned aſide.*
dd *The bottom of the Womb where the Foal lies.*
ee *The jagged Orifices of the Trumpets of the Womb.*
ff *The broad Ligaments that ſuſtain the Womb.*
g *The* Clitoris.
hh *The outward Orifice of the Sheath of the Womb.*

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THE END.

ERRATA.

Pag. 123. lin. 37. for *inner* reade *outer*. ibid. lin. 40. for *outward* reade *inner*.